



#4

SEQUENCE LISTING

<110> Haygood, M.  
Davidson, S.K.  
Allen, S.W.  
Hildebrand, M.

<120> Bryostatins, Bryopyrans and Polyketides: Compositions and Methods

<130> 1133.010US1

<140> US 09/775,938  
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<150> US 60/147,283  
<151> 1999-08-04

<160> 38

<170> FastSEQ for Windows Version 4.0

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<212> DNA  
<213> Endobugula sertula

<220>  
<221> misc\_feature  
<222> (1)...(17)  
<223> N in this sequence refers to I or inosine.

<400> 1  
acrtgngcrt tngtncc 17

<210> 2  
<211> 15  
<212> DNA  
<213> Endobugula sertula

<220>  
<221> misc\_feature  
<222> (1)...(15)  
<223> N in this sequence refers to I or inosine.

<400> 2  
ncayggnacn ggnac 15

<210> 3  
<211> 18  
<212> DNA  
<213> Endobugula sertula

<400> 3  
acggacaagc gtcattac 18

<210> 4  
 <211> 18  
 <212> DNA  
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 acggacaagc gtcattac 18  
  
 <210> 5  
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 <400> 5  
 gttgtctttg cagcatcgca tgttaccac 29  
  
 <210> 6  
 <211> 25  
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 cacgcccgt atcccagcac ctacc 25  
  
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 tgctatttga tgagcccgcg tt 22  
  
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 catcgctgct tcgcaaccc 19  
  
 <210> 9  
 <211> 315  
 <212> DNA  
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 <400> 9  
 aaattgggtg atccgataga agtcgagaca ttggcagaat cgtttcgagt ctatacggac 60  
 aagcgtcatt actgtgctct ggggtcggta aaaagtaata ttggtcattt gggggtaggt 120  
 gctgggatag cgggcgtgac caaagtattg ttgtctttgc agcatcgcat gttaccacg 180  
 acgattcatt gtgaggatgt aaaccacag attgcgttgg aaggtagccc cttttatatac 240  
 aatacggaat taaagccttg gcagtcctgg gacggtatac cacgacgggc tgggtgcagt 300  
 tcttttggtg tcagt 315  
  
 <210> 10  
 <211> 105  
 <212> PRT  
 <213> Endobugula sertula

<400> 10  
 Lys Leu Gly Asp Pro Ile Glu Val Glu Thr Leu Ala Glu Ser Phe Arg  
 1 5 10 15  
 Val Tyr Thr Asp Lys Arg His Tyr Cys Ala Leu Gly Ser Val Lys Ser  
 20 25 30  
 Asn Ile Gly His Leu Gly Val Gly Ala Gly Ile Ala Gly Val Thr Lys  
 35 40 45  
 Val Leu Leu Ser Leu Gln His Arg Met Leu Pro Pro Thr Ile His Cys  
 50 55 60  
 Glu Asp Val Asn Pro Gln Ile Ala Leu Glu Gly Ser Pro Phe Tyr Ile  
 65 70 75 80  
 Asn Thr Glu Leu Lys Pro Trp Gln Ser Gly Asp Gly Ile Pro Arg Arg  
 85 90 95  
 Ala Gly Val Ser Ser Phe Gly Val Ser  
 100 105

<210> 11  
 <211> 736  
 <212> DNA  
 <213> Endobugula sertula

<400> 11  
 aaattgggtg atccgataga agtcgagaca ttggcagaat cgtttcgagt ctatacggac 60  
 aagcgtcatt actgtgctct ggggtcggta aaaagtaata ttggtcattt gggggtaggt 120  
 gctgggatag cgggcgtgac caaagtattg ttgtctttgc agcatcgcac gttaccaccg 180  
 acgattcatt gtgaggatgt aaaccacacag attgcgttgg aaggtagccc cttttatatc 240  
 aatacgggaat taaagccttg gcagtcctgg gacggtatac cacgacgggc tgggtgtcagt 300  
 tcttttgggtg tcagtggtac caatgcacat cttgtattag aagaatatac tcaccgagta 360  
 acatcaccat tacaaaatac tattttaccc cagaacgggt tgtttattgt tccactatct 420  
 gcaaaaaatg atgaatgctt aaatgcttgt gtogaacgac tggtattttt tctaaaaagc 480  
 aggcaatccg atacatataa aaaatattcc ttaagtata cagctcctat attgtagat 540  
 ttagcatata cctccagggt cagtagggaa gcgatgacaa aacgagttgc cttttagtg 600  
 aaaacaacaa tagagttaat ggaaaaatta aatgcattta tagaaaaaca aaatactata 660  
 aaagcaagta atataaaagg ttgttactac tcttcgacta aaacatcgag tccatttgat 720  
 aatgaatcga ctgac 736

<210> 12  
 <211> 245  
 <212> PRT  
 <213> Endobugula sertula

<400> 12  
 Lys Leu Gly Asp Pro Ile Glu Val Glu Thr Leu Ala Glu Ser Phe Arg  
 1 5 10 15  
 Val Tyr Thr Asp Lys Arg His Tyr Cys Ala Leu Gly Ser Val Lys Ser  
 20 25 30  
 Asn Ile Gly His Leu Gly Val Gly Ala Gly Ile Ala Gly Val Thr Lys  
 35 40 45  
 Val Leu Leu Ser Leu Gln His Arg Met Leu Pro Pro Thr Ile His Cys  
 50 55 60  
 Glu Asp Val Asn Pro Gln Ile Ala Leu Glu Gly Ser Pro Phe Tyr Ile  
 65 70 75 80  
 Asn Thr Glu Leu Lys Pro Trp Gln Ser Gly Asp Gly Ile Pro Arg Arg  
 85 90 95  
 Ala Gly Val Ser Ser Phe Gly Val Ser Gly Thr Asn Ala His Leu Val  
 100 105 110  
 Leu Glu Glu Tyr Thr His Arg Val Thr Ser Pro Leu Gln Asn Thr Ile  
 115 120 125

Leu Pro Gln Asn Gly Leu Phe Ile Val Pro Leu Ser Ala Lys Asn Asp  
 130 135 140  
 Glu Cys Leu Asn Ala Cys Val Glu Arg Leu Leu Phe Phe Leu Lys Ser  
 145 150 155 160  
 Arg Gln Ser Asp Thr Tyr Lys Lys Tyr Ser Leu Ser Asp Thr Ala Pro  
 165 170 175  
 Ile Leu Leu Asp Leu Ala Tyr Thr Leu Gln Val Ser Arg Glu Ala Met  
 180 185 190  
 Thr Lys Arg Val Ala Phe Val Val Lys Thr Thr Ile Glu Leu Met Glu  
 195 200 205  
 Lys Leu Asn Ala Phe Ile Glu Lys Gln Asn Thr Ile Lys Ala Ser Asn  
 210 215 220  
 Ile Lys Gly Cys Tyr Tyr Ser Ser Thr Lys Thr Ser Ser Pro Phe Asp  
 225 230 235 240  
 Asn Glu Ser Thr Asp  
 245

<210> 13  
 <211> 312  
 <212> DNA  
 <213> Endobugula sertula

<400> 13  
 cgattaggtg atccaattga attggcagca ctctogaagg cgtttgagga gggaacacaa 60  
 cgaaaacagt tttgcggtat cggttcagta aaatcaaata ttggatcatct ggatgttgct 120  
 gctggagtcg ttggtctgat caagacagca ttgtcgtctgc agcacggtt gttgcctccc 180  
 acgatcaact acgaagcacc caatcgggaa atcaattttg aacaatcacc ctttcatgtg 240  
 attgatgaac tcacggagtg gcgggggtcaa ggtggaccac ttcgtgctgg tgtcagctcg 300  
 tttggaattg gt 312

<210> 14  
 <211> 104  
 <212> PRT  
 <213> Endobugula sertula

<400> 14  
 Arg Leu Gly Asp Pro Ile Glu Leu Ala Ala Leu Ser Lys Ala Phe Glu  
 1 5 10 15  
 Glu Gly Thr Gln Arg Lys Gln Phe Cys Gly Ile Gly Ser Val Lys Ser  
 20 25 30  
 Asn Ile Gly His Leu Asp Val Ala Ala Gly Val Val Gly Leu Ile Lys  
 35 40 45  
 Thr Ala Leu Ser Leu Gln His Arg Leu Leu Pro Pro Thr Ile Asn Tyr  
 50 55 60  
 Glu Ala Pro Asn Arg Glu Ile Asn Phe Glu Gln Ser Pro Phe His Val  
 65 70 75 80  
 Ile Asp Glu Leu Thr Glu Trp Arg Gly Gln Gly Gly Pro Leu Arg Ala  
 85 90 95  
 Gly Val Ser Ser Phe Gly Ile Gly  
 100

<210> 15  
 <211> 324  
 <212> DNA  
 <213> Endobugula sertula

<400> 15  
 caattgggcg accctattga actgcaagca ctggccgatg tgtatagagt tgataactgg 60

|  |     |
|--|-----|
| cgcaaaaaca cctgtgccct cggctcggta aaaagcaata ttggccatac ctctgcggcc  | 120 |
| tctggtgtgg ctggtatata caaggtgctg ttatcgctta agcatcgaca attagtagcg  | 180 |
| agcctgcatt ttaatagcgc caatcaccac tttgatatttc aacagtcgcc tttttatgtc | 240 |
| aatacccagc taaggccctg ggatcaagca gagggactag aagaaagccg ccgccgggct  | 300 |
| gcggtcagtt cttttggtgt cagt   | 324 |

<210> 16  
 <211> 108  
 <212> PRT  
 <213> Endobugula sertula

<400> 16  
 Gln Leu Gly Asp Pro Ile Glu Leu Gln Ala Leu Ala Asp Val Tyr Arg  
 1 5 10 15  
 Val Asp Asn Trp Arg Lys Asn Thr Cys Ala Leu Gly Ser Val Lys Ser  
 20 25 30  
 Asn Ile Gly His Thr Ser Ala Ala Ser Gly Val Ala Gly Ile His Lys  
 35 40 45  
 Val Leu Leu Ser Leu Lys His Arg Gln Leu Val Ala Ser Leu His Phe  
 50 55 60  
 Asn Ser Ala Asn His His Phe Asp Phe Gln Gln Ser Pro Phe Tyr Val  
 65 70 75 80  
 Asn Thr Gln Leu Arg Pro Trp Asp Gln Ala Glu Gly Leu Glu Glu Ser  
 85 90 95  
 Arg Arg Arg Ala Ala Val Ser Ser Phe Gly Val Ser  
 100 105

<210> 17  
 <211> 308  
 <212> DNA  
 <213> Endobugula sertula

|  |     |
|--|-----|
| <400> 17   |     |
| gagtatggag atccaatgga attgacggct gcagctgccg tctttggacg aggacgaaat  | 60  |
| cagaaaaatc gtttgctggt cggatcagta aaagccaata ttagtcacct ggaagcagcc  | 120 |
| gggggtatatt ctggactgat caaagcagta ctggcaatgc agcatggcgt gattccacag | 180 |
| caattacact gcaaagaacc gagtccctcat atcccctgga aacgtctgcc tctcgatttg | 240 |
| gtacaagagc agactgtctg gccggaaagt gaagagcgga tcgcggctgt aacagcgtcg  | 300 |
| gattagcg   | 308 |

<210> 18  
 <211> 101  
 <212> PRT  
 <213> Endobugula sertula

<400> 18  
 Glu Tyr Gly Asp Pro Met Glu Leu Thr Ala Ala Ala Ala Val Phe Gly  
 1 5 10 15  
 Arg Gly Arg Asn Gln Lys Asn Arg Leu Leu Val Gly Ser Val Lys Ala  
 20 25 30  
 Asn Ile Ser His Leu Glu Ala Ala Gly Gly Ile Ser Gly Leu Ile Lys  
 35 40 45  
 Ala Val Leu Ala Met Gln His Gly Val Ile Pro Gln Gln Leu His Cys  
 50 55 60  
 Lys Glu Pro Ser Pro His Ile Pro Trp Lys Arg Leu Pro Leu Asp Leu  
 65 70 75 80  
 Val Gln Glu Gln Thr Val Trp Pro Glu Ser Glu Glu Arg Ile Ala Ala  
 85 90 95

Val Thr Ala Ser Asp  
100

<210> 19  
<211> 300  
<212> DNA  
<213> Endobugula sertula

<400> 19  
caacttggcg atgaaataga agttcgcgct ctgagtaaag tgtacggaga ttcacagtcc 60  
acgacatacc ttggtgctgt aaaaagcaac ataggatcatg ccaacgcagg agcgggcatt 120  
gctgggtttta ttaaaacggt gctgtctctt taccatggca aaattgcacc caatgcaggc 180  
aataccgagc ccaatgcagc tttgaacctt gacgcgtttc attttgcatt accaaaaact 240  
ttgcttacat ggccggagtg tgatgttcga cgggcagcga tcagctcact ggggttttgg 300

<210> 20  
<211> 100  
<212> PRT  
<213> Endobugula sertula

<400> 20  
Gln Leu Gly Asp Glu Ile Glu Val Arg Ala Leu Ser Lys Val Tyr Gly  
1 5 10 15  
Asp Ser Gln Ser Thr Thr Tyr Leu Gly Ala Val Lys Ser Asn Ile Gly  
20 25 30  
His Ala Asn Ala Gly Ala Gly Ile Ala Gly Phe Ile Lys Thr Val Leu  
35 40 45  
Ser Leu Tyr His Gly Lys Ile Ala Pro Asn Ala Gly Asn Thr Glu Pro  
50 55 60  
Asn Ala Ala Leu Asn Leu Asp Ala Phe His Phe Ala Leu Pro Lys Thr  
65 70 75 80  
Leu Leu Thr Trp Pro Glu Cys Asp Val Arg Arg Ala Ala Ile Ser Ser  
85 90 95  
Leu Gly Phe Gly  
100

<210> 21  
<211> 304  
<212> DNA  
<213> Endobugula sertula

<400> 21  
gccttgggtg atcctattga atttggcgca atcaaggctg tgtatgggac tggtcggtct 60  
tctccgctgg tgctcgggtgc acttaaactc aacatcgggc atttgggaagc gactgcaggc 120  
gttgcagctc tgattaaggc agttttgggt cttcaacatg gcgtgggtcc ggccaatttg 180  
cactgtcaca aattgaatcc gcttctggat atcgacggct tcaatgttgt gttcccgcag 240  
tctgagaccc ccttgacacag ctctctgcag ctacttggcg ggtatcagtt cgttcggggt 300  
tggt 304

<210> 22  
<211> 101  
<212> PRT  
<213> Endobugula sertula

<400> 22  
Ala Leu Gly Asp Pro Ile Glu Phe Gly Ala Ile Lys Ala Val Tyr Gly  
1 5 10 15

Pro Gly Arg Ser Ser Pro Leu Val Leu Gly Ala Leu Lys Ser Asn Ile  
20 25 30  
Gly His Leu Glu Ala Thr Ala Gly Val Ala Ala Leu Ile Lys Ala Val  
35 40 45  
Leu Val Leu Gln His Gly Val Ala Pro Ala Asn Leu His Cys His Lys  
50 55 60  
Leu Asn Pro Leu Leu Asp Ile Asp Gly Phe Asn Val Val Phe Pro Gln  
65 70 75 80  
Ser Glu Thr Pro Leu His Ser Ser Leu Gln Leu Leu Gly Gly Tyr Gln  
85 90 95  
Phe Val Arg Val Trp  
100

<210> 23  
<211> 314  
<212> DNA  
<213> Endobugula sertula

<400> 23  
acttggtgat ccctattgag gtgggggctc ttacagaatc atttcgatcc ctatacagaa 60  
aaaaagaact actgtgcctc gggatcggta aaaagcaata tcgggcatct ttttaaccgcg 120  
gccggagtat ctggagtagt caaagtgtta ctcgctttga aacataagca acttccacct 180  
tcctgtcatc tggtgaaaat caatgagcat atcaaccttg aggacagtcc attttatatc 240  
aatacggcat taaagaaatg ggaagtatcg gaaggtgagg ctcgcagggc cgcagtcagc 300  
tcgtttggtt cagc 314

<210> 24  
<211> 103  
<212> PRT  
<213> Endobugula sertula

<220>  
<221> SITE  
<222> (1)...(103)  
<223> Xaa = Any Amino Acid

<400> 24  
Thr Trp Xaa Ser Leu Leu Arg Trp Gly Leu Leu Gln Asn His Phe Asp  
1 5 10 15  
Pro Tyr Thr Glu Lys Lys Asn Tyr Cys Ala Ser Gly Ser Val Lys Ser  
20 25 30  
Asn Ile Gly His Leu Thr Ala Ala Gly Val Ser Gly Val Val Lys Val  
35 40 45  
Leu Leu Ala Leu Lys His Lys Gln Leu Pro Pro Ser Cys His Leu Val  
50 55 60  
Lys Ile Asn Glu His Ile Asn Leu Glu Asp Ser Pro Phe Tyr Ile Asn  
65 70 75 80  
Thr Ala Leu Lys Lys Trp Glu Val Ser Glu Gly Glu Ala Arg Arg Ala  
85 90 95  
Ala Val Ser Ser Phe Gly Ser  
100

<210> 25  
<211> 306  
<212> DNA  
<213> Endobugula sertula

<400> 25  
ccactcggcg acccaatcga gatggcagca ttaaaacagg cttttgggac tcaaaagaaa 60  
aaatactgtg cgataggggtc ggtgaagagc aacattgggtc atgccgatac ggcggtctggc 120  
gtcgtctggtc tcatcaagac ggtgatggca ctcaaggcgc gtcagatacc gcctagcttg 180  
cactttgaga cccccaatcc gcagatcgat tttgccgaca gtccctttta tgtaaataca 240  
accttgaaag attggaacac caacggtggt ccgcgccgcg cgggcgtgag ttcgtttggc 300  
atcgggt 306

<210> 26  
<211> 102  
<212> PRT  
<213> Endobugula sertula

<400> 26  
Pro Leu Gly Asp Pro Ile Glu Met Ala Ala Leu Lys Gln Ala Phe Gly  
1 5 10 15  
Thr Gln Lys Lys Tyr Cys Ala Ile Gly Ser Val Lys Ser Asn Ile  
20 25 30  
Gly His Ala Asp Thr Ala Ala Gly Val Ala Gly Leu Ile Lys Thr Val  
35 40 45  
Met Ala Leu Lys Ala Arg Gln Ile Pro Pro Ser Leu His Phe Glu Thr  
50 55 60  
Pro Asn Pro Gln Ile Asp Phe Ala Asp Ser Pro Phe Tyr Val Asn Thr  
65 70 75 80  
Thr Leu Lys Asp Trp Asn Thr Asn Gly Val Pro Arg Arg Ala Gly Val  
85 90 95  
Ser Ser Phe Gly Ile Gly  
100

<210> 27  
<211> 309  
<212> DNA  
<213> Endobugula sertula

<400> 27  
gtggtcggag atccgattga ggtcgtggga ctgacgaaag cctatcaagc gcacactcag 60  
gaacgtcaat actgcggact gggttcgggtg aagacgaata ttggccatac ggactcgggt 120  
gctggcattg ctggacttct caagatcgtc atggcgatga agcatcgta actgccgccg 180  
agcttgaatt ttgaaacacc aaatccagac ctggatctgg agaatagtcc gttcttcatc 240  
cagacgaagc tgaaggattg ggaaagtgtg gggcctcgtc gtgccgcgtt gagttcgttt 300  
ggtttgggt 309

<210> 28  
<211> 103  
<212> PRT  
<213> Endobugula sertula

<400> 28  
Val Val Gly Asp Pro Ile Glu Val Val Gly Leu Thr Lys Ala Tyr Gln  
1 5 10 15  
Ala His Thr Gln Glu Arg Gln Tyr Cys Gly Leu Gly Ser Val Lys Thr  
20 25 30  
Asn Ile Gly His Thr Asp Ser Ala Gly Ile Ala Gly Leu Leu Lys  
35 40 45  
Ile Val Met Ala Met Lys His Arg Gln Leu Pro Pro Ser Leu Asn Phe  
50 55 60  
Glu Thr Pro Asn Pro Asp Leu Asp Leu Glu Asn Ser Pro Phe Phe Ile  
65 70 75 80



Gln Thr Lys Leu Lys Asp Trp Glu Ser Val Gly Pro Arg Arg Ala Ala  
85 90 95  
Leu Ser Ser Phe Gly Leu Gly  
100

<210> 29  
<211> 6000  
<212> DNA  
<213> Endobugula sertula

<220>  
<221> misc\_feature  
<222> (386)...(388)  
<223> TAG may represent a transposase open reading frame.

<221> misc\_feature  
<222> (444)...(449)  
<223> TTGAAA may be a possible -35 trascription control sequence.

<221> misc\_feature  
<222> (458)...(463)  
<223> GATAAT may be a possible -10 trascription control sequence.

<221> misc\_feature  
<222> (474)...(502)  
<223> ATCAATAAAAA and TTTTATTGAT are inverted repeats.

<221> misc\_feature  
<222> (576)...(583)  
<223> TGAGGAAT may be a possible SD sequence.

<221> misc\_feature  
<222> (565)...(567)  
<223> ATG encoding M is presumptive start of PKS Open reading frame.

<221> misc\_feature  
<222> (589)...(591)  
<223> GTG encoding V is is possible alternative start of PKS Open reading frame.

<400> 29  
gatggaactc attaccaccc acaaaaaagt ccgtttcttc aacgcggttg atttaattaa 60  
ccagctaatac aacgaacaac aaaagcagca aacgggcaaa ctcatcagag ccttattgca 120  
ggtggattgt ttaagtattg atgaactcgg ttatatccca ttccctaaat ccggtggggc 180  
gttgctcttc cacctcatca gtaaaccggtg tgagaagacc agtattatca tcagcaccaa 240  
tctggctttt ggggaatgga acagtgtgtt tggatgatgcc aagatgacca ccgcgttatt 300  
ggatcgtatc acgcatcatt gttcaatcat cgaaaccaag catgcgtcgt atcgttttaa 360  
gcagagtcag aaacagacat gaaagtagct ttcaccggtg ggacagtgtt agatgcaaac 420  
cccgggtcag cttaaagtgc aatttgaaaa ccaatgtgat aattgtggct aagatcaata 480  
aaaataaaat ttttttattg attatgatga tccacgttaa aaaaaatact ataaatatga 540  
aataatattt caactttatt tttgatggtc gttggtgagg aattttttgt gagttatcga 600  
gatattttga aggctttaca ggatgaaaaa attagttttg aagaggctaa atataagtta 660  
ataaaaagaa aagataaaaa atcaaaacag cgtttaaatc atgatcgtga attaaatcga 720  
tcgatgaata ttacgcaaaa aatagtgaat aattacggtt tagtattatt gggcggtcat 780

|             |             |            |             |             |             |      |
|-------------|-------------|------------|-------------|-------------|-------------|------|
| ttatttgaag  | aactccgtct  | gagtgaatgg | aaagctgcc   | accctaacc   | taatgaagtt  | 840  |
| agcattcagg  | tcaaggcatc  | cgccattagt | tttaccgata  | ccttgtgtgt  | acaaggttta  | 900  |
| tatccatcac  | actatccctt  | tgttccgggc | tttgaagtat  | cgggagtgat  | tcgtcaagtg  | 960  |
| ggtgaacaca  | taaccgactt  | acacgtgggt | gatgaagtta  | ttgcgttcac  | aggatcatca  | 1020 |
| atgggagggc  | atgctgccta  | tgtgacggtg | ccacaagatt  | acgtggtacg  | aaaacccaag  | 1080 |
| gacttatctt  | ttgaggatgc  | ctgtagcttc | ccattggctt  | ttgcgaccgt  | ctatcacagt  | 1140 |
| tttgacggg   | gaaaattatc  | tcacaacgat | catatcttga  | tacaaacggc  | gacaggtggc  | 1200 |
| tgtggtttga  | tggcacttca  | gttggcgctg | ttaaagcagt  | gtgtgtgtta  | tgggacctcc  | 1260 |
| agccgagaag  | acaagcttgc  | actcctcaaa | cagtgggcac  | tgccctacgt  | cttcaattat  | 1320 |
| aagacgtgca  | atattgatga  | ggagattcaa | cgcgtcagtg  | gtcatcgagg  | tgctgatgtc  | 1380 |
| gtcttaaata  | tgctcccagg  | agagcatata | caacaagggc  | tgaatagttt  | agccaagggga | 1440 |
| ggccgttatt  | tggaaactgtc | gatgcatgga | ttgttaacga  | acgaacctgt  | cagtctgtcg  | 1500 |
| tctctgcgtt  | ttaatcaatc  | cgttcaaacc | atcaatttac  | tggggttact  | caataagggg  | 1560 |
| gatgatggct  | ttatcgggtc  | tgtattagcg | caaatggttt  | cctggattga  | atcaggtgat  | 1620 |
| ttagtgtcaa  | ccgtgtcgcg  | tatttatccg | ttggatcaga  | tcggtgaagc  | gttacgttat  | 1680 |
| gtctctgaag  | gggagcatat  | aggtaaagtc | gttgtgagtc  | atacagcgac  | agagccgatg  | 1740 |
| gattgcagac  | agcgtgtgat  | tgacaatgta | ttgaagcaag  | ggcaaattggc | ggccttgacc  | 1800 |
| gcgacagggg  | gaaaaagccg  | ggtgtggggg | ggtactgggtg | tcaatgacaa  | accgtctcct  | 1860 |
| gctgttggtg  | tagaggagcg  | tttattggaa | gggtagcgcg  | tgattggtct  | gtcaggccag  | 1920 |
| tatccgaagt  | cgaagacact  | ggagcaattt | tggcagaccc  | tagcggatgg  | agtggattgc  | 1980 |
| atctcagaga  | ttcctgctga  | tcgctggctg | ttagaagagt  | attactcgcc  | aataccggaa  | 2040 |
| gggggtaaaa  | cgtattgtaa  | gtggatgggt | gttttggagg  | acatggattg  | ttttgatccg  | 2100 |
| ttgttttttg  | cgatatctcc  | tcgggaagcg | gaagtgatgg  | acccacagca  | acggttattt  | 2160 |
| ttagagaatg  | catggagttg  | tatagaggat | gcggggatta  | accctaagat  | gttatcccg   | 2220 |
| agtcgatgtg  | gggtatttgt  | tgggtgcggt | gcgaatgatt  | acagcgctct  | aatgaacagt  | 2280 |
| agccactcaa  | cgagtctcga  | attaatgaag | gaattaggca  | acaactcttc  | cattttatct  | 2340 |
| gcacgaatct  | cctacttttt  | aaatttaaag | ggcccttgct  | ttgcgattga  | taccgcatgt  | 2400 |
| tcttcttcat  | tagtggccat  | tgccgagtcg | tgtaatagtc  | tgggtgttggg | tactagtgc   | 2460 |
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| tttgtaacctg | gagaggggtg  | cggcgttgtc | ttgttaaaac  | gcatgtcgga  | tgcggtgcgt  | 2640 |
| gatgggtgatc | ccattcgtgc  | agtgatacgg | ggctgggggtg | tgaatcagga  | tggtagaagt  | 2700 |
| aatggtatta  | cggcgccgag  | ttcaaaagcg | caaagtgtct  | tggagcaaga  | ggtttatcaa  | 2760 |
| cgttttaata  | ttgatccatc  | gagcattacc | ttagtcgaag  | cacacggaac  | gggcaccaa   | 2820 |
| ttgggtgatc  | cgatagaagt  | cgaggcattg | gcagaatcgt  | ttcgagtcta  | tacggacaag  | 2880 |
| cgtcattact  | gtgctctggg  | gtcggtaaaa | agtaatatgt  | gtcatttggg  | ggtagggtct  | 2940 |
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| attcattgtg  | aggatgtaaa  | cccacagatt | gcgttggaag  | gtagccctt   | ttatatcaat  | 3060 |
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| aaaagtcata  | atagtttata  | cacatatgct | caaacgctat  | tgatattttt  | aaaacgtagt  | 3300 |
| caggttactg  | acgctaaaaa  | aatcacaata | gatcacatgg  | aatgtcgctt  | gttggattta  | 3360 |
| gcctatactt  | tgcaagtggg  | tcgcgaggca | atggacaaac  | ggataagttt  | tattgtcaac  | 3420 |
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| gcatggtgga  | gccgatggaa  | cacggagtat | aagcattacc  | agaatgatcc  | ggaaaaaaag  | 4140 |
| acgttagcga  | tattgattaa  | cgattgctta | caggcattac  | caggggtgtt  | aagtgggtgag | 4200 |
| caattaataa  | cggatattat  | tttccccaat | ggttcgatgg  | agaaaatgga  | aggcttatat  | 4260 |

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| ggtagcgggg  | gcaccaccgc  | gatatgtctg | ccaatgttac  | aagcctatca  | ggatcatatc  | 4440 |
| gatacgattt  | gttatacggg  | tgtttccaaa | gcctttttga  | tgcattggaca | ggaacactac  | 4500 |
| ggcgaacaat  | acccctatct  | gagttattgc | ctctgtaata  | ttgaacagga  | cttagtggtc  | 4560 |
| caaggaatca  | gcgttggtga  | ttatgatatt | gcgatcgcag  | ccaatgtatt  | acatgccacg  | 4620 |
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| gacgctcgtg  | agttgggtca  | acaaatcatc | ctggcaacca  | acgcccattg  | gaacgttgct  | 4920 |
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| caacaggagt  | cgatagcgat  | tattggtatg | agcggacggg  | ttgcggcgctc | agaaaaacctg | 5460 |
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| ctggaggaat  | cctggaatgc  | actggagaat | gcgggttatg  | tgggtgatgg  | catagaaggc  | 5700 |
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| caacccccgc  | cccaggcttt  | ttggggcaat | gccagttcta  | ttattcccgc  | ccggattgcc  | 5820 |
| tattatttaa  | atcttcaggg  | ccctgctacc | gcgggtggata | ctgcctgctc  | aagttctctg  | 5880 |
| gtggcggtgc  | atttggcctg  | ccaggcccta | cacctggatg  | aaatggagat  | ggccttggca  | 5940 |
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| caacggttat  | ttttttaaat  | gagttaacca  | aaaaagngtt  | tttgnagtgt  | aaattgggtt  | 120 |
| gncganggtt  | ggccttat    | aananaggga  | ttgngtattc  | ttgaaaccca  | gggttatctt  | 180 |
| ctaacagtgc  | aancgggtact | gagggcgtcg  | ntttgggttac | gtgaatttcc  | gctccatgac  | 240 |
| gctcgtgagt  | tgggtcaaca  | aatcatcctg  | gcaaccaacg  | cccatgcgaa  | cgttgtagcg  | 300 |
| atcttgcgac  | atcggtgatt  | gatcatgccc  | ccaagagatt  | gccatccgcc  | gaggtcagca  | 360 |
| tggataaaga  | gtagccatga  | tgccatgatg  | aaggcatcgg  | tcaaacagtt  | gttggtagag  | 420 |
| caattatccc  | agtctttaaa  | actggatatg  | aatgagattc  | accctgacga  | atcctttgcc  | 480 |
| gattatgggtg | ttgattccat  | taccgggtgct | agttttattc  | aacagcttaa  | tgacacgctg  | 540 |
| acactgaytt  | kraagackkt  | gtgtttgctt  | gatcacagct  | cggtaaaccg  | actgacggcc  | 600 |
| tatctgttat  | ctgactatgg  | tgatgatatc  | gcgcagtggg  | tagcaacggc  | accagcgttg  | 660 |
| gttgatcatc  | cacagagtgt  | cgtcagtcag  | gtgttgccctg | aaaggctcgcc | agcaagcaca  | 720 |
| caagccaagc  | ccttgccctt  | agtcctccct  | tcgttatcga  | tggagtcacc  | cgttcaacag  | 780 |
| gagtcgatag  | cgattattgg  | tatgagcgga  | cggtttgcgg  | cgtcagaaaa  | cctggaagcg  | 840 |
| ttttggcaac  | agttggcaca  | gggtgtggat  | ttgggtcgaa  | ccgcgtcacg  | ttggggggcca | 900 |
| caagcggaga  | cttactacgg  | cagktttyctc | aaggatatgg  | atcaatttga  | tcctctcttt  | 960 |

|             |            |             |             |             |             |      |
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| gaatcctgga  | atgcactgga | gaatgcgggt  | tatgtgggtg  | atggcataga  | aggcaagcgt  | 1080 |
| tgtggtat    | atgcgggtt  | cgtgtccggt  | gactacgcac  | aactgttggg  | cgaccaaccc  | 1140 |
| cgcgccagg   | ctttttgggg | caatgccagt  | tctattat    | ccgcgccgat  | tgctattat   | 1200 |
| ttaaatcttc  | agggccctgc | taccgcggtg  | gatactgcct  | gctcaagttc  | tctggtggcg  | 1260 |
| gtgcatttgg  | cctgccaggc | cctacacctg  | gatgaaatgg  | agatggcctt  | ggcaggagggt | 1320 |
| gtgtctcttt  | atccaacccc | natcattgta  | tgagtctttg  | cgtggtgcag  | atatgctctc  | 1380 |
| ttcgaggggg  | cgttgccaca | ngctttgatg  | cctgtgccsa  | cggtatcgtc  | attkgtgaat  | 1440 |
| gggtgggggk  | ggtgngngc  | taaaacgctt  | gtcggcgga   | tttggccgga  | tggcnaatca  | 1500 |
| tattcacgga  | gtgattgctg | gcagtgggtat | caantcaaaa  | cggtcgtagt  | aamtgggaat  | 1560 |
| acgggcaccc  | agtgcmaaa  | tscaaagaac  | gcttggaac   | gttgggttnt  | atgatcgctt  | 1620 |
| tgdtgyaac   | cttkagcaha | tkagcatgkt  | cgaaggccvd  | tggacagggc  | acgrgdytta  | 1680 |
| ggtgkacccc  | arttgaayrt | daaacyttam  | acccggvggt  | ttagacactw  | adacgsaata  | 1740 |
| aagaahaatd  | htgvghatc  | gsgtcggcnc  | aaaaccaata  | tgggamacyg  | gsaccatggt  | 1800 |
| wggtcgggt   | tggggggctt | gtkkgatrrt  | kkaaagntgg  | tgtgtcgat   | gcaacaccgg  | 1860 |
| caaaatacct  | ccatcgctac | atcttactca  | gggcaatccg  | aatattgact  | ttgatcgag   | 1920 |
| tcttttttat  | gtgaacaccg | agcttcgtga  | ttggtcgggtg | ggtgaaggag  | agacccggtg  | 1980 |
| tgcgacgggtg | agcgcttttg | gatttagtggt | taccaatgac  | catgcagtga  | tagaagaagc  | 2040 |
| gcccgcagtc  | gtgcgccaac | atgaagagca  | gcccgggttat | ttaagtggtc  | ttatcggcgc  | 2100 |
| atagtgatga  | tcaattacgg | cagcaagggt  | gagaacttta  | tgcgggttat  | tgtgagcatc  | 2160 |
| accctgagtt  | ggatgtgggc | aartcytgag  | rttatacctt  | attgnttggg  | ntcgtcaaca  | 2220 |
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| ggatcagtggt | nttgggtcag | ggtaaggctc  | cccgagtgtg  | tgtngtctng  | canttggtcg  | 2340 |
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| antgcagtga  | gtcctgttct | gcgaatcact  | atgtggacgc  | gttatcgacg  | gtgggggawt  | 2460 |
| tatatgttca  | gggttatcca | ttggagtatg  | gtgtgttgtt  | tgscakggc   | watrrwcktw  | 2520 |
| ttsskttkcc  | gamctakssg | tttscwarke  | agcgttgttg  | ggtaccacaa  | acaataagcc  | 2580 |
| actccacagt  | ggatgctata | tcacagcatg  | cttttttaca  | tctttgttta  | catcgaaata  | 2640 |
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| agtttatttg  | cattactaaa | ggtggctcgc  | tcagaaaacc  | ccaaagtgat  | tacacaatta  | 4020 |
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| ttatytcwtt  | mcgggaggka | ccggtggagt  | tagcgtcaca  | gtttgtcaaa  | gcgwtgagcag | 4260 |
| tgagtccac   | aaaatcggtg | ttaatcttkg  | taggkcskct  | accactcmat  | grtgaaaaga  | 4320 |
| aatcttawtt  | aactagaact | ggratccggt  | gggggaccat  | tattaawtmc  | tatcaraacr  | 4380 |
| gatgtaagcc  | aacanggatc | aagttaaagc  | wttgwttaaa  | raaattkttc  | ascawtmcgg  | 4440 |

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| tcaattgaaw | ggkgktttsy | attgtgcagg | tattgtcaac | gacaatttta  | ttctcaaaaa | 4500 |
| gtcctcgaca | gaatacaaa  | aggatttggt | gtntaaagta | tcnggtntctg | tcaatttaga | 4560 |
| ccaggcanca | canagnatag | agatggattt | tcttatnnta | ntaaaaacgt  | tatctgcagt | 4620 |
| attcgganmn | acagnacagg | gtnttagata | atngtccaaa | tactttttcc  | agggtgtggg | 4680 |
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| aaatgcagggt | caatcagatt  | attcaacggc | aaataaattt  | atggatgagt  | ttgcacgcta  | 120  |
| tcgtaatgct  | ctgggtcaatc | gcaaagagcg | ctatgggttta | acactatcga  | ttaattggcc  | 180  |
| gtactggaga  | gaaggaggta  | tgagtattga | ggaaaatttt  | gaaaatataa  | tgcaagagaa  | 240  |
| taccggtatg  | tccgccttgg  | agacatcaca | aggatttgaa  | gtattacaaa  | gagcttggca  | 300  |
| gttgcagtac  | acgcaattgt  | tggtaatggt | cggagagatg  | aagcgaatgg  | agagcttttt  | 360  |
| gcacaagcag  | ggtttcgagc  | agattcctgt | ggtatccgcc  | gatactgtca  | gcgagaataa  | 420  |
| aacctcgact  | attgagaatc  | tttcagccga | tgtagatata  | ttaccattca  | ttgaggttca  | 480  |
| ggcatacaat  | atggaacaaa  | aaacccttga | ttacttaaaa  | aatgtatttg  | ccaccacaac  | 540  |
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| attgttggtg  | atgaaaatga  | ccaatcaatt | ggaaaaagta  | tttggaaaat  | tatctaaaac  | 660  |
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| tgaaaagtta  | aggggagttt  | ttcagataga | tagcaaaacta | tctatgttaa  | ataatcacgg  | 780  |
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| aaatgttaac  | aatggttccm  | atantcatca | gccagtaatg  | ggatattggc  | gawtattggg  | 960  |
| tctgagkggg  | tcgttattcc  | mcaagcctga | gaaatatnng  | aggggaatact | ggggaagaaa  | 1020 |
| tttgtgtcaa  | nggcaaggga  | ctggtattan | cnggaaantt  | ccaaanggag  | ccgttggggg  | 1080 |
| ttggsaagac  | tattwyacms  | mtnnngatcc | stattcagcc  | mgttgggaca  | tcgcagtaaa  | 1140 |
| tnggggkgtg  | tttattcggg  | atggtgataa | gttcgatccg  | ttatttttta  | atatttcccc  | 1200 |
| tagkgrggkg  | gagctyrcts  | atcctcagga | aykwtatttt  | yctagrgtcc  | gcgtkggctg  | 1260 |
| cattggaaga  | ccctggawat  | tgccgggnat | tatttgcaaa  | tgttgtcatc  | aaggactaaa  | 1320 |
| tcttcattct  | cgtcggraga  | tgttgggtgt | tatgtggrag  | tratgtcttc  | agaatatcag  | 1380 |
| ttgtttgctt  | ttgaacagaa  | wttacgtggt | caccccatat  | cctcnggttg  | ggagttatgc  | 1440 |
| cagtattgct  | amccsggtgt  | cttatgtttt | aratctacac  | nggcccaasc  | atgacagtgg  | 1500 |
| atmcgatgtg  | ktctarttcg  | ttaacgacgc | twcacctagc  | atgkcgagg   | tttaaaactg  | 1560 |
| ggkcgaaact  | gaccygggta  | ttgkcgggkg | agttaawatt  | accattcacc  | ccmataaata  | 1620 |
| tyaggsctg   | agtcacgcyc  | aaattattty | tactagtggg  | sgttgccaaa  | rttttggtga  | 1680 |
| acagggacag  | ggttatatcc  | ctggtgaagg | agtgggtgcc  | ataatactga  | agcgcttggt  | 1740 |
| cgatgccgag  | cgtgacgggtg | atcatattta | tggtgttggt  | aaaggcagtg  | ccgttaacca  | 1800 |
| tggtgggtaa  | accaacgggt  | ataacgttcc | taatccgaat  | gcacaacagc  | aagtgggtgag | 1860 |
| tcgtgcacta  | cgagaagccg  | cagtaaacc  | ccatcatgtg  | acttatattg  | aggcacatgg  | 1920 |
| aacaggaacc  | caattgggtg  | acccgataga | aattactgkt  | ctrammaaag  | cgttcaatag  | 1980 |
| tttgaccaat  | gagcttggtt  | taagcgctgt | gsccaaacma  | tygkgtttga  | tcggstcark  | 2040 |
| gaagtcaaaa  | tatagggcat  | tgtgagycas | caagccgggtg | ttgcagctat  | tagcaaagta  | 2100 |
| ttgttacaaa  | tgcaacacgg  | gtcaaatagt | cccttcttta  | cattcaaaa   | cattgaaatcc | 2160 |
| caatattgat  | tttactgtga  | ctccctttgt | agtaaaccac  | gggttattgg  | actggaaaacg | 2220 |
| acttgaagtt  | gaaggaaaaga | gggtrccgag | aatkgtckky  | mwwwckkytt  | ttggggccgg  | 2280 |
| tgggtcaaat  | gccccatgtag | tgattgagga | gtacgttgcc  | agcaatgaaa  | agcaagagga  | 2340 |
| ttttcaagga  | aaagtaatta  | tccctttatc | ggcwatagac  | ttskgatcar  | ctacaaraaa  | 2400 |
| warkggatcg  | tttgcttaag  | tttatcraaa | aaaatgaagc  | aaaraggtag  | ggaawtksgc  | 2460 |

|             |             |             |             |            |             |            |      |
|-------------|-------------|-------------|-------------|------------|-------------|------------|------|
| ttaattgwt   | ty          | ttgcgcgawa  | cattgcaact  | tgggcgcgag | gtcaatgara  | ggaacgtctg | 2520 |
| gncmttngan  | ttgtaggaat  | cnaataccaa  | atgcttaang  | gaaagatttt | agcaaaggnt  |            | 2580 |
| ttaaatactc  | agaaaatnga  | tgcacanatt  | tttcggatac  | ttatcaaaag | rcattttatc  |            | 2640 |
| gggggttcgta | ctagacctgg  | gtgcggttgra | tttcgctatt  | ttttctgaag | atgaagaata  |            | 2700 |
| tggccaacac  | gcttgatatt  | ttggattcaa  | aaaggtaaat  | actttaagnc | tggcggagct  |            | 2760 |
| ttgggtaaaa  | ggtgtgacta  | ttgattggaa  | taaatggtat  | aacgcattat | taaccagaa   |            | 2820 |
| taaatatttg  | aaacntcgt   | cgtattagtt  | tgcnaacng   | tatccttttt | ccagggatcg  |            | 2880 |
| ttattggatt  | nccnaagtgc  | ttttccacaa  | ncaaacattt  | tctacagtaa | ttgaggcaga  |            | 2940 |
| cgccaaccma  | aacattgaat  | gagctactgt  | gttttgaaga  | aaaatggcag | gtgcaatcgg  |            | 3000 |
| aactacatga  | ctctgttgca  | gatcaatcta  | atgttatcaa  | tacattaatt | tgtttttttaa |            | 3060 |
| ctgagaaaga  | gcataaaaa   | gcattacaac  | aatcaatatc  | attccatagc | ccgaaaacac  |            | 3120 |
| gattgatttt  | tatcagccag  | gctcaggctt  | atgagcagta  | ttcatcagat | cactatgcgg  |            | 3180 |
| ttaatccaga  | aataggaaag  | acgtaccaac  | aggcttttca  | acacattgtg | aaaagtattc  |            | 3240 |
| ataaaagtga  | tgtaacggac  | ataatgtatt  | tatgggctct  | agaggatgaa | cgctggatta  |            | 3300 |
| cgtctcctct  | acctattgta  | tatcttttaa  | aaagtattga  | ggtttcttta | ttaaaaccar  |            | 3360 |
| aaaaattact  | atttgttggg  | gaatttaaga  | caagcttakc  | rroaytgty  | acyykraakc  |            | 3420 |
| cwrgrkkgggw | tygmamrwy   | ckkwaksgtt  | dgtgcaacs   | ratwtkragg | ttgcgggtgt  |            | 3480 |
| attaraggcm  | rtgggaagga  | ctyaatccca  | tmcagtga    | aagcaaatgg | atctttggat  |            | 3540 |
| agaaaaattg  | tggtcgtcct  | taaaagccca  | aaaagttcat  | agtagcttat | acccaaatgg  |            | 3600 |
| tcgtagatat  | ttttctgaaa  | accccamccg  | ctgcaanctt  | gtcatgaacc | aaagtattca  |            | 3660 |
| aatgcttaca  | gggracttta  | ttgataacag  | stgsygtgr   | aggactgggt | tttgtcttyg  |            | 3720 |
| cagattattt  | ttccaagaca  | tataaaatta  | atctgatatt  | ggttggggcg | tctgatcttg  |            | 3780 |
| ataaagagaa  | agswwtcgsr  | ratwcrgrmt  | ykkgwmaat   | caggtagtcg | agtggcttat  |            | 3840 |
| gttcagacgg  | atatctgcga  | tgaaaagaat  | ctccaattgg  | aattggatat | tgcccaaaaa  |            | 3900 |
| tattgtggcc  | ctattcaggg  | tgtaattcat  | gcgcgggca   | tcattgatca | gaagacaatt  |            | 3960 |
| tttgaaaaaa  | gtcctgaaaa  | ctttcaagca  | gtattagccc  | ntaaaattca | gggtacattg  |            | 4020 |
| attctggata  | acgtattgtc  | agcgcaatca  | ctggatttta  | tatgttactt | ttcttcaagc  |            | 4080 |
| tcggctctat  | taggtgatgc  | aggatcatgt  | gattatgcaa  | tggctaatac | atttttgatg  |            | 4140 |
| gcccattgcac | agtatagaaa  | tacctyggta  | tctgaargaa  | aamscaaggg | raagacmctg  |            | 4200 |
| kttwttcatt  | ggcccgccctg | gaatgtgaaa  | ggaatgggat  | tgaatggact | ggaatgagaa  |            | 4260 |
| cgtgaaamca  | ragttctwty  | ttaagtccaa  | gcgggcaasg  | tctattggac | ataaaggaag  |            | 4320 |
| gttgtgaggt  | tattgaacac  | atttctggct  | caggattatt  | ytcagtgtcy | tawattggst  |            | 4380 |
| ggkaggaaaa  | accngtatcw  | aacaattttt  | tgggtctcac  | acaaagatgt | ttctnacctc  |            | 4440 |
| acaagtgagt  | caagggcagg  | magtrawgaa  | cwwasrrswk  | kmykkrrass | ksyamyaaac  |            | 4500 |
| gagctgagat  | agaagacttt  | aagtgttgaa  | gaatgtatta  | ttttggactt | aaaaactctg  |            | 4560 |
| attacagagc  | aacttaaaa   | acccatcagc  | tcattctggat | gtagagagta | atttagcaga  |            | 4620 |
| ttttggtttt  | gattcgggtca | gttttagcaaa | cttttcccg   | gstttaagta | ttcmctatca  |            | 4680 |
| ttycaawawt  | acgcortstk  | tatttttcgg  | atatoctacc  | atagagcgty | taarccgtta  |            | 4740 |
| ttttttaaaa  | gaacmcmctg  | cgsttatgga  | ggcgttttat  | cagcagaaaa | aaacatytw   |            | 4800 |
| tagtaacaat  | acvctgtccg  | ntatagtccy  | tcatgtcaaa  | gaaaagccgw | caactgatct  |            | 4860 |
| aatatcatcc  | arcngcctct  | nccttttatt  | gcagatccat  | tgccccctca | ggstattgag  |            | 4920 |
| agtattgatg  | agcctattgc  | cattattggt  | atgagtggtc  | gttttccaga | agcgcgtacg  |            | 4980 |
| gnntaaagca  | atgtgggaga  | ttttatccga  | aggtaaaagt  | sytgtgcagg | agattcctat  |            | 5040 |
| agagcgcttt  | anattggcat  | gaatattatg  | aacacccatc  | ggatgatggt | ygaanaandb  |            | 5100 |
| taatagtaaa  | tggagygcct  | gcattcctgg  | tattaaagaa  | ttcgatccac | aatttttcga  |            | 5160 |
| aatttctcca  | agagaggcaa  | aaaarctgga  | ccctcttcaa  | cggcwcttat | cacaggaatc  |            | 5220 |
| mtsgaatgca  | ttggwaaats  | ctgcttatgk  | wwwmywacrc  | wkwgmtmwtw | aracratggg  |            | 5280 |
| ataykttkat  | tggrtrtgaw  | smaggktwt   | atmmrrrymw  | gmtcaatkmr | gwygacsgca  |            | 5340 |
| cacwttwawc  | catmakrmta  | ttttrgcata  | ccmgtytgsc  | agtwytywtt | arakyttaat  |            | 5400 |
| ggscmwrrsa  | tggcwrtwaa  | wrcgcwtgy   | tcctccgsyw  | tgggygcrmt | tcaccamgct  |            | 5460 |
| kscsysagtt  | tackwcarca  | agcaatkyga  | wrcgscakaw  | gwcscggcag | cwwwyttrmw  |            | 5520 |
| mwwyacrssk  | sawswtkaws  | tggscwtgay  | ssawgsgrgy  | mtgakmysac | mwgawgsyat  |            | 5580 |
| amygawakac  | ckarnrtcam  | csygccaaks  | gcryagtgmy  | tggakagsmw | gytgwtgcar  |            | 5640 |
| tcgtaytgma  | acrwmtcttk  | sgggktttcc  | aaaagggggt  | mmaaat     |             |            | 5686 |

<210> 32

<211> 4744

<212> DNA

<213> Endobugula sertula

<220>

<221> misc\_feature

<222> (1)...(4744)

<223> N refers to any nucleotide.

<400> 32

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| ggtgaattta  | taagccaatt  | aaccngtgat | ttagtttgga  | atatgaaaga  | acccgtttta  | 120  |
| tttgactatc  | ngaataattaa | tactttatcg | aatatgatcg  | agaatgaact  | cgaagctggt  | 180  |
| gaggtatagt  | tatgttagaa  | gttattaata | gatactgcca  | tggatacgta  | ttcgtgccag  | 240  |
| tggtattggc  | cntagaagaa  | aaagggtttt | ttgacctttt  | tacaaggaat  | agatacctta  | 300  |
| catttgaaaa  | aataaaaaaca | gaattaaatg | ctaatagtgg  | ccatcttcaa  | gtagccttac  | 360  |
| gcatgttgca  | gtctgtttca  | tggatatcat | gtgatgataa  | agggtatgta  | ctaacagatg  | 420  |
| cagcggacga  | aagaaataaa  | atatctagtg | attttataga  | gctttttaat  | ttctctatga  | 480  |
| gtcgtctattt | agaaaatatg  | gaaaggcatg | gattaaaaaa  | atggatagat  | caatccggag  | 540  |
| ataactgggg  | tatttcaaac  | cctgtattaa | ccgatttttt  | ggatgggtgt  | ttaattattc  | 600  |
| ccttattact  | agaactgaag  | gaaaatgggt | attttgatgc  | gttaaaaaat  | gkwaatagtc  | 660  |
| taaataaaaa  | attattttta  | ggntgatatc | gaacaatcgg  | nttcgcaawg  | aaattattac  | 720  |
| actattttta  | acaaaagaac  | tggtccaag  | agaatraaag  | agacgtttta  | cttcacaaaa  | 780  |
| ntctggtcaa  | tttnaycact  | caacgaattt | ttattaccgc  | aatccattgc  | ttcttataag  | 840  |
| cccatgttta  | tctcgggata  | acggaattaa | tgtttggtaa  | tgctaggagt  | atttttaaaa  | 900  |
| agggtattgca | tggagaggag  | agccatgttg | accgaacctt  | aatgtttatt  | ggtagtggtt  | 960  |
| ttcaacatca  | aaagtacttc  | gctgatatcg | aagcgttagt  | cattcagtta  | tttaatgata  | 1020 |
| mtttktacga  | tsraywsccg  | aaatrkrttp | crratatggg  | ttgtgggtgat | gggactctac  | 1080 |
| taaaaaatat  | ttacaatatt  | atcaaggaaa | aatctgcacg  | aggaaacgtg  | ttgaatcact  | 1140 |
| atcccggtgt  | acttattggt  | attgattata | atgaagccgc  | tttgaggaa   | actaacaata  | 1200 |
| cactggcagg  | tggtgatata  | agacactatg | ttttaaagg   | cgatattggt  | gatcctgaag  | 1260 |
| gaatgataag  | tgatctatat  | gatttaggta | ttaaagatcc  | tgagaatata  | ttgcatgtgc  | 1320 |
| gttcattttct | ggatcatgat  | cgtccttata | ttgcacccac  | agaggtgatg  | aatattgaag  | 1380 |
| cacgttcaaa  | gatatttgat  | cagggcgtgt | atgttgattc  | agaaggtcaa  | gcaatatcgc  | 1440 |
| ctgtggttat  | gatacaaagt  | ctggtggaac | attttaaacy  | ctggtcttgt  | gtaaagacga  | 1500 |
| aacatggctt  | gcttatatta  | gaagtacatt | ctcttaaccc  | tgaggttgtc  | aaccaatatt  | 1560 |
| tggatgaaag  | tgaaagtttg  | cattttgatg | cctatcatgg  | ttttctctct  | caatatttag  | 1620 |
| tatcggctga  | ggattttcta  | atatgtgtcg | cagaagctgg  | tttattttct  | aaacctgatg  | 1680 |
| tttctcaaaa  | ttatccaagg  | aacttacctt | ttactogaat  | taccctaaat  | ttttttgaaa  | 1740 |
| aaaagcctta  | tcaaatcgt   | caccogaatg | aaaatgattt  | gtctgcattg  | atggatttag  | 1800 |
| aaaaaatttg  | tgcacctaat  | aatcaatggt | tatgcattga  | tgaccttcgc  | caacgcatag  | 1860 |
| atgaataccc  | aaaagggtcaa | tgtgttttag | aattaaacaa  | taccattggt  | gcagtgattt  | 1920 |
| attcacaaaa  | gtgtattaat  | agagtgttag | gcactgctgc  | agggtgttgg  | carswswwtg  | 1980 |
| scmdhggaa   | rtgbdwdcac  | datttvtaba | thactbgttt  | atcaatdtaw  | trcccaaaat  | 2040 |
| aaaaaaagaa  | tatgccatmc  | aattattaca | gtttatcttc  | tatytatcat  | ggtgttcawa  | 2100 |
| atgatgttga  | agatgttatc  | ggtattgatg | aatgttatca  | gtgcttaa    | gagaaaacga  | 2160 |
| tacaagcagg  | cagttttatg  | gaaagtga   | cagttgatgt  | tttatattcc  | aagagtagaa  | 2220 |
| aaacatattg  | ctaagtatcc  | caatagatat | tggagtaaat  | gctctggatg  | cagagcagga  | 2280 |
| aatgggggtg  | tttgggtgcta | agtgggtact | atctattttt  | caaagccaag  | gagtgatgaa  | 2340 |
| aaaatcaggt  | gagtattatc  | aaaaagatca | attngagggt  | gatgttaa    | attattccaa  | 2400 |
| aatattatcg  | attatttgag  | tgcttgctac | tcatatttng  | aaaaagaaa   | gcttatttca  | 2460 |
| attcaaaaaa  | atacnggtgc  | aaacactttc | caatattgat  | gaatttgctc  | ttaacgatcc  | 2520 |
| attggtntga  | gtttgcttcg  | tnttaagcgt | acgttttctc  | ctcaatatgc  | tagccttatg  | 2580 |
| ccgwtctctac | gattaatggc  | atcgtgcctt | tctcgggtatt | tggaaatatt  | aacaggcaaaa | 2640 |
| atacaggcgc  | atgacattat  | ttttccagaa | nggagggatg  | aatttatttg  | aagggtattt  | 2700 |
| taaaggctat  | caactttcag  | actattttta | tcatattctc  | gcagagctga  | tttatgaaag  | 2760 |
| ggctanacgc  | tctatccggt  | gggtaatatg | aantaaaaaca | attcgtattt  | tagaaataag  | 2820 |
| gagcagggtac | ctgggtgggtc | caacagagtt | tgtattngaa  | tagnagcttc  | mccgctnctc  | 2880 |
| gaatgggttat | aagagtttta  | cntatactgg | atatctnctg  | ccntcgttcc  | ttcgttatgg  | 2940 |

|             |             |             |             |             |             |      |
|-------------|-------------|-------------|-------------|-------------|-------------|------|
| gagaaaagtn  | agatttttycc | gataaatatn  | ccctggtn    | caatataagg  | tgtagatat   | 3000 |
| ntgaaagnca  | atttagantg  | cacaaggggt  | ttaccctgat  | agctttgata  | ttngtgtatg  | 3060 |
| catctaagt   | tnctccacga  | tacgaaawta  | tatacagtat  | accctttccc  | aaagtgagtc  | 3120 |
| acatgctaac  | gcaaaatggc  | nttgtaaatg  | ttgaatgaan  | tttactcngg  | atgaanggat  | 3180 |
| ttgttactgt  | ttaccgggtg  | tttgtagat   | ggcctttggg  | tatatgaaga  | ccctaccaat  | 3240 |
| cgattggata  | atgtctgctt  | gttaaagtgt  | gatcagtggc  | gatctatatt  | atttaaataca | 3300 |
| ggctttnaaa  | aatgttaaag  | actttgtttt  | accttttgaa  | aaacttaata  | ttgagcaaag  | 3360 |
| tcaaagtatt  | attgtctctg  | agtggattaa  | tgaagacctg  | tctagtaatg  | nttgaaaatg  | 3420 |
| tggtgaaaaa  | taatcanttg  | tttnagaaat  | acaaaatcac  | tcntgatncc  | gattactngt  | 3480 |
| ggagnaataa  | aattagntta  | caattnaaaa  | gacaantcmc  | wtcggttanca | caatagtatt  | 3540 |
| ggaagaaaat  | atTTTTataa  | aatttttagng | gggataaaaa  | gaaaattatn  | ggatttttct  | 3600 |
| ccntaaacgc  | ccctttgatt  | ggagtttatg  | gggttgattc  | atattcgaac  | ctacnttgga  | 3660 |
| anttaaagat  | cattactcgg  | kracmtyt    | tcyataaaac  | trgaasmtac  | tttkkmtky   | 3720 |
| mawkatkraa  | yrmtksckkm  | rsctmtytgw  | kwcmtccsay  | atsattcmag  | wtrascytsr  | 3780 |
| watrtcgmt   | arakwcccta  | ttacggaaga  | gataatgact  | ggaggtacgt  | caagggtaar  | 3840 |
| aacagggcaa  | tcgaatsaka  | atgaacctat  | tgcgattatt  | ggtatgtcyt  | gtttatttcc  | 3900 |
| aggtgaggtt  | acgacagttg  | atgagttctg  | ggaattatta  | atacaagaaa  | gacatgcrt   | 3960 |
| tcaaccctta  | cctaagggac  | gttggcaatg  | gccakaaggt  | gttgatccat  | cgggagcaca  | 4020 |
| acttggcatt  | gatcaggggtg | gatttctgga  | tggtattgat  | acctttgatg  | ccsacttctt  | 4080 |
| tcgtatatcg  | agaaaagaag  | cggagttwat  | ggaccctcas  | caaagaaaac  | tacctggaat  | 4140 |
| taarttggca  | ggtcatasag  | catgccggat  | ataaaccctat | cgytTTTTc   | tggtcaaaga  | 4200 |
| natygyyate  | tatgtggggg  | gctttgtcac  | cggtaattta  | tatgggagtt  | atttaactaa  | 4260 |
| aagtgaccaa  | angccctaaa  | aaccaaccgg  | naaggcctat  | ttkatgacc   | argtartana  | 4320 |
| ttgttgttcg  | tyttttcccc  | aataanaatt  | ttcctatttt  | ntattaattt  | tttaaargtg  | 4380 |
| cccmsectec  | tctwtctgat  | wccgngcttg  | ttcaaryagt  | tttaggttgc  | ctwtttgacc  | 4440 |
| caancarttt  | tatgcgnatt  | caattcgggg  | nangngtgga  | atcaggcntc  | tggtgggntg  | 4500 |
| gggaycaatt  | waatrtcccc  | tccsmrtgaw  | accggtttct  | tnattayywa  | gcaggtntgt  | 4560 |
| tntcaaaaatc | ngggaatgta  | aacctttnga  | tccaccgccc  | gttggttttn  | tncttgggna  | 4620 |
| aaggggggcgc | tnttcttttt  | ttnaatcntt  | ttctcanccc  | nattttaaaa  | ngattgtttt  | 4680 |
| ttngggggtt  | taaagggggg  | agatnaaaat  | ngggggcaan  | cattnnnttac | ggccctaacc  | 4740 |
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<210> 33

<211> 1954

<212> DNA

<213> Endobugula sertula

<220>

<221> misc\_feature

<222> (1)...(1954)

<223> N refers to any nucleotide.

<400> 33

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| aagaagataa | gtcaatataa  | tgtaactcag   | aaaaatcaat  | tcccaaatg  | aataccccnc | 120 |
| aatcwataca | aaaaawattg  | awagattttt   | kggtkgacat  | tactaacttt | ttsgaggcna | 180 |
| agacatcmat | ccmrngcmgga | tgccctgggtga | ctatgggtgkt | gattccatta | ttaggtaga  | 240 |
| gatttyttaa | tcgaattaac  | cyccaccttt   | aawatagaag  | ctgatgcttt | attactaaca | 300 |
| gaaggaacga | ttmaccagta  | tatctcataa   | arkwcmittct | tttattgttg | ataaaaaaaa | 360 |
| ttacccaatg | ttaccaaat   | ttggattaga   | aatgattct   | aataaagaaa | ataaaggctg | 420 |
| ggtaaagcct | tcttttattg  | aatttattaa   | atttgaaatc  | aatcctgaat | atatagaaag | 480 |
| cagtacaaaa | aataaagatt  | acgcgattct   | tgaaaatcta  | ataaataatg | gagttggagt | 540 |
| ttggagagaa | aataatcatc  | tatgttttga   | gtttttttat  | gaaactcata | caaatgaaac | 600 |
| aattaaaaaa | atagtgtttt  | cacccgaaat   | actttttaac  | tctctagata | aaggtaaacy | 660 |
| atactttcca | agtagctgcc  | agcaaaaaaa   | cagtctatat  | caaacggaag | ttgagaagtt | 720 |
| tccatataat | cttattcaag  | gatttagagt   | ggaaatgcca  | gtcaatattg | aaattttaaa | 780 |
| taaagcattt | aatcatttgg  | ttaacacata   | ttcaattttc  | agaacaaaag | caatgttgat | 840 |
| caataagcaa | tggattcagg  | taatacatga   | tggtttatca  | gtaagatgcg | aaganaatta | 900 |



|            |             |            |             |             |             |      |
|------------|-------------|------------|-------------|-------------|-------------|------|
| yatacgaagg | attatctgca  | ggaaaaagat | tttacgcaac  | aactaatnag  | tattttcaaaa | 960  |
| agagcaagg  | aaaaaattat  | ttgatatcga | taatctgcct  | ttattaaaaa  | tttattttat  | 1020 |
| ccataatgg  | aaagacttag  | cagctatttt | tggtcatg    | catcattttt  | gtgccgatgg  | 1080 |
| atttacattt | ttttcttttc  | agaaagaatt | tcatgatact  | trtgaaagta  | ttatraacgg  | 1140 |
| antggrwat  | ccggaaacgk  | gttcsawaaa | gtgatggctg  | aatatggcca  | ctttgcattg  | 1200 |
| tgtgaatata | atcccaaaaa  | caaggagctg | acaaaaaact  | ggcttgataa  | aattcgagat  | 1260 |
| aaaaattttt | ctttaaaatt  | taaagataag | aaagactatg  | tcggtcaact  | gtcaagtggg  | 1320 |
| gaaaaaatta | ttgagctaga  | agtttctgta | aatatgctgg  | aaaaattaag  | attatttaaat | 1380 |
| gatgcgaata | ataccacact  | gacgcaattg | ctatgttg    | ctgttgcaat  | tttactgtat  | 1440 |
| cgcctctcga | ggctaccagt  | acccttgcaa | atgggtcaaca | gccgtagaga  | taaaatagaa  | 1500 |
| tttgaaataa | tgatgggtga  | ttttgcatca | actctgccct  | atggatttta  | ggaacctttc  | 1560 |
| caaaagcatt | ttctctattc  | cnggatggta | ccttttttaa  | gttattggaa  | aaanggaaaa  | 1620 |
| aggcnttnaa | ttntcccccc  | naggattttt | taaanggggt  | ttggatnntt  | tntcngggaa  | 1680 |
| ccctcaanaa | aaaaaaaaatt | tntttccaaa | aaaaaaagg   | gcccccttaa  | ntccccatta  | 1740 |
| agggaatttt | ttaaattttt  | taatttcccg | ggnaaaatta  | ttnttttaaa  | ttccggaatt  | 1800 |
| aaggccnaan | tggaattaat  | tggnaaaatt | tccantttgg  | gttttttaaaa | aggggaaaaa  | 1860 |
| ncccannaat | ttgggtttcc  | ttaaaaanaa | aaaaaaagg   | gngngccccc  | cgggtgggttc | 1920 |
| nttnttgggg | gnaaaaattt  | aaaaatttaa | tttn        |             |             | 1954 |

<210> 34

<211> 2672

<212> DNA

<213> Endobugula sertula

<220>

<221> misc\_feature

<222> (1)...(2672)

<223> N refers to any nucleotide.

<400> 34

|             |             |             |             |            |            |      |
|-------------|-------------|-------------|-------------|------------|------------|------|
| anccgaaaaa  | naccnaaagg  | gnngccggcc  | cntgtcctnc  | gagtgcatna | taaaaaancc | 60   |
| agtnataagn  | nggnnacaat  | antcatgccc  | cgcgcccnc   | gnaagnaacc | tnantgggtt | 120  |
| naaggcttca  | agggcacg    | tcaaggaacc  | tttcggcg    | cttttgctgt | gcgacaggct | 180  |
| cacgtntaaa  | aaggaaataa  | atcatgggtc  | ataaaattat  | cacgttgctc | ggcgcgcg   | 240  |
| acgaatgttc  | tgatg       | gtttttccgt  | ggcgcggtg   | tgctggtga  | tctgccttct | 300  |
| aaatctggca  | cagccgaatt  | gcgcgagctt  | ggttttgctg  | aaaccagaca | cacagcaact | 360  |
| gaataccaga  | aagaaaatca  | ctttaccttt  | ctgacatcag  | aagggcagaa | atttgccgtt | 420  |
| gaacacctgg  | tcaatacg    | ttttgggtgag | cagcaatatt  | gcgcttcgat | gacgcttggc | 480  |
| gttgagattg  | atacctctgc  | tgcacaaaag  | gcaatcgacg  | agctgsrctm | scrmaktygk | 540  |
| gmcmccgkmw  | cctwmrarst  | twttcscaaw  | rragkktywt  | tmawmaagsm | cscygskrky | 600  |
| gswwtggwr   | ctawccacgm  | arcssmwty   | gaaamaccks  | rkyggnktkw | csrawawmwa | 660  |
| cmrsmycasc  | cttgawawmm  | armrwsmtga  | sywgckcw    | aamaakgtwa | ccstcrkgc  | 720  |
| cgmwggkcc   | aawkttwmac  | cysrwrwrr   | ymcmaamatt  | garrcsttgm | ycgraaccsc | 780  |
| gmtgaaaaan  | ncgctghntg  | nnaatgtrvg  | gcgtntggat  | gtchcaaagc | aatggcasc  | 840  |
| agacaangaa  | agcgatggat  | gaactnnngg  | cttccttatg  | tccgcccggc | caktcatgat | 900  |
| ggaatgtttc  | ccccsggtgg  | tggtatctgg  | caccagtgcc  | gtcgatagnt | antgcnaant | 960  |
| tngantaant  | tnattnatca  | tttngncggg  | ntcctttnc   | gngcgatccn | gccttggtta | 1020 |
| cggggcgcg   | acctcgncgg  | gttttcgcta  | tttatgaaaa  | ttttccggtt | taaggcggtt | 1080 |
| ccgttcttct  | tcgtcataac  | ttaatgtttt  | tatttataaat | accctctgaa | aagaaaggaa | 1140 |
| acgacagggtg | ctgaaagcga  | gctttttggc  | ctctgtcgtt  | tcctttctct | gtttttgtcc | 1200 |
| cgtggaatga  | acaatggaag  | tcaacaaaaa  | gcagagctta  | tcgatgataa | gcggtcaaac | 1260 |
| atgagaattc  | gcggccgcat  | aatacgactc  | actataggga  | tcataattat | ggtgttatta | 1320 |
| aagggaagtgc | catcaatcat  | ggtggcaaaa  | ccaatggcta  | tagtgtgcct | aatccggata | 1380 |
| agcaacagcg  | tgatcattagt | gaggctttgc  | agcgggctca  | aatagctcct | catcaagtca | 1440 |
| gttatgtaga  | agcgcatggg  | gcgggaagcc  | gttttaggcga | cccaatagaa | attacggctc | 1500 |
| tcagcaaaagc | atttaacaat  | gttagtg     | aatttaaatgt | gaaaagtgc  | gccaatcaat | 1560 |
| cggtgtttat  | tggtctcggt  | aaatccaata  | taggaaactg  | tgaatctgca | gcagggacnt | 1620 |
| gccagtatta  | gcaaagtatt  | gctacaaatg  | aaacatgggg  | aaatagtgcc | gtccttgcat | 1680 |

|             |            |            |            |            |            |      |
|-------------|------------|------------|------------|------------|------------|------|
| tcaaaagaac  | tgaatcccaa | tattgatttt | tcagcaactc | cctttgtggt | taaccaagaa | 1740 |
| ctgcgcgatt  | ggcagagacc | gctgattgat | ggaaaaacag | tgccgagagt | tgcggtgtgc | 1800 |
| ttttcatttg  | gggcaggttg | ttccaatngc | nttacgtggt | gattgaagag | tatattgcca | 1860 |
| agataccgac  | aaataacacc | agggaatcta | taaaccatag | gtctattatt | ccattatcag | 1920 |
| cacgaactgc  | tgagcagttg | cggcaaattg | ccagtagatt | gctggcattt | attgaaaaga | 1980 |
| acaagcaaga  | cagcgtgggt | accccttaa  | tagatattgc | ttatacattg | caggtaggac | 2040 |
| gcgaagcaat  | ggatgaacgc | ttggggttta | ttgtgagttc | aaccgatga  | attagtcgaa | 2100 |
| gaactacgaa  | gatatcttca | aacacacgat | gatatggaag | agctttatcg | aggtcagggt | 2160 |
| aatcgatatg  | aagacacctt | tcttactatg | gcggctggat | ggaagatctc | tcttgaggct | 2220 |
| atccccacca  | tttgggatta | aaaaacgaaa | aactggctct | aagttaaag  | ccaattattt | 2280 |
| gggatttaaa  | aggggtcttt | gtggatttaa | wttkgggrkr | agwtatassw | tkkyttmcca | 2340 |
| aargrkgwtw  | ktccycsgcr | matkarmkka | ytacctrtcc | yttyggcrs  | matattttta | 2400 |
| rgwtkkttamm | swtyrnmccc | tcwtwcctyt | ttktgrcccc | aggnccaaa  | tttattttng | 2460 |
| tttgngggga  | atttngtttt | aaaaaagaat | tcggttaanc | ccacctnccn | ttaaactttc | 2520 |
| attttggggg  | gnaatgggtt | ttattgnaa  | cccattccna | aaacaaaaaa | ngggcctttt | 2580 |
| ttttttccat  | tcnaaaaaaa | accaaatttt | ggcccccttt | ttgggggggg | gaaaaaaaaa | 2640 |
| acccnaangg  | ggaaaaattn | tttttaaaaa | aa         |            |            | 2672 |

<210> 35

<211> 2132

<212> DNA

<213> Endobugula sertula

<220>

<221> misc\_feature

<222> (1)...(2132)

<223> N refers to any nucleotide.

<400> 35

|             |             |             |            |            |            |      |
|-------------|-------------|-------------|------------|------------|------------|------|
| nnnanntttc  | cnattccctt  | gggcggaaat  | tttttgccca | gggnccgnat | aaccaaagga | 60   |
| ccctttttcn  | ggccccctta  | aaaaacccaa  | tttccccnt  | ttaatcccc  | cgaataaaag | 120  |
| aacctttccc  | aaaaaaagg   | naanttgaan  | tggggggnan | cntgggaaat | cccaagccaa | 180  |
| aaaaaggccc  | aaymtcgccc  | waraacrkkc  | cawwaatsss | gawaasmcyy | ccagawarwa | 240  |
| ttkwtkrrwa  | mrawcyagy   | wmwscamatc  | rgrtgttwt  | tgrrrssrg  | wmyawwtraa | 300  |
| aarymytcca  | wyktkttkss  | grrtcaatka  | tgssrkwtty | tcaaymttg  | gactcmcyym | 360  |
| tcmmmwwttt  | gaaaaccmyw  | attatakktr  | taagsgggcc | aaataatcaa | tgttgatata | 420  |
| gggttaamccg | ataaaaaaaa  | gcctcaataa  | attttnctgc | caacaactaa | gacagctcta | 480  |
| caataaacat  | aaaagcaata  | atgagtcctt  | gtgattattt | cccatgaaaa | aaacaatggc | 540  |
| attttaatat  | atagatctca  | tactgaatcg  | aatattgcca | ttataggtat | atcagggtgt | 600  |
| tttccggatg  | caaaaaatgt  | taatgaattt  | tgggaaaatt | taaaaaatgc | tcgtcatagt | 660  |
| gttaaagaaa  | ttccctataa  | ccggtcttgg  | gatattgata | attactttga | tacttcttcg | 720  |
| caaacacatg  | cacaggaata  | tgtaaaca    | ggagcatttt | tagaaaatat | cgatcttttt | 780  |
| gatccgctgt  | tttttaatat  | ttctccggtg  | gaagcagagc | ttatggatcc | aactgaacga | 840  |
| tttttccttc  | aggaatcctg  | gaaagcgatt  | ganangatgc | tggttatgat | gcatcaaact | 900  |
| ntaagtggaa  | aacgntntgg  | ggggtatttg  | cctgtgcaaa | gggagactac | catgccatta | 960  |
| ttcacaagca  | ggataaaaact | cgtatcatga  | ccactgactc | tatgcctcct | gccagggttg | 1020 |
| cttattttatt | gaatttgnnt  | tagggcctgc  | agttcacggt | gatancnggc | ttgttcatcn | 1080 |
| gtctttggca  | gcaattgctt  | acgcatgtga  | tagcctcatt | cttagaaatt | gtgatgttgc | 1140 |
| cattgcagga  | ggtggaaata  | tcaactcaac  | tcccagcctt | ttgatcagtt | caagtcaact | 1200 |
| tggtttggtg  | tcaaaagatg  | gccgatgtta  | tgctttsdat | caacgtgcaa | acggaacggt | 1260 |
| attagggggag | gcggtascac  | cgattatttt  | aaaaccctta | caacaagcga | ttgacgatgg | 1320 |
| tgatcaggtc  | tacggattaa  | ttaagggttg  | gggaatgaat | caaratggaa | aaaccaatgg | 1380 |
| tmttactgct  | cctagtgtta  | agtcacaaat  | tcakttggaa | acggatgttt | atcaaaaatt | 1440 |
| tatgatwaat  | cctgaacata  | ttackatggt  | tsmagcccat | ggaactggga | ctaaactasg | 1500 |
| agatcccat   | gaggytcagg  | cattamcaga  | agcttttcas | aaatatacty | aaaaaacakg | 1560 |
| gtmttggtgca | ctagngttct  | ttraaaaarwa | aatattggac | atacnttttt | cccgtgctg  | 1620 |
| graktckcta  | gatgttaatm  | aagggttttg  | ttgtccattt | cwcancatty | acmargwttc | 1680 |
| yytycrtart  | twtaattyw   | maarstatna  | mttwttcaww | attcctatyg | tnaawwaccc | 1740 |

|            |            |            |            |            |             |      |
|------------|------------|------------|------------|------------|-------------|------|
| ywattttkkw | ktaaaamcag | cycatwttw  | wyyssskgtm | attwwnyycc | nctttwtttrw | 1800 |
| wncccmmytt | gcgrrcsgtt | tttttcgk   | ktgtttcrwc | akagaatctm | mmsycctttt  | 1860 |
| ytygcmmmma | anmrnnttaa | acmmmtwrc  | tttytttrgr | kggsgycccc | cncccnngggg | 1920 |
| gaancccca  | antgggtccc | cnnttttggg | gggggggntt | tngnnaangn | aaaatttttt  | 1980 |
| tttcatgccc | nnanaaaagg | tccttcgcga | acctttttta | aaaaataanc | ccntccccna  | 2040 |
| aaaanttggg | natttgggan | tggaattaa  | aaaggccctt | tttttacc   | cccnggttta  | 2100 |
| attttaattc | cccccttttt | tggttcggg  | cc         |            |             | 2132 |

<210> 36

<211> 2169

<212> DNA

<213> Endobugula sertula

<220>

<221> misc\_feature

<222> (1)...(2169)

<223> N refers to any nucleotide.

<400> 36

|             |             |             |             |            |             |      |
|-------------|-------------|-------------|-------------|------------|-------------|------|
| nnaccaattt  | tccgaaaccc  | aagncatttt  | gaaaggggtt  | tttggggccc | gggggttga   | 60   |
| aaaaaaangg  | ggtttttttg  | ccccccccc   | nnagnaanta  | aaaatgggta | aggaaacncgc | 120  |
| ccccccactt  | tggaaaacct  | tccccnaaaa  | aaaataaaaa  | ggcnttttga | attttttaac  | 180  |
| naaaatnncg  | gggngtgggc  | cntttaaana  | acccccccnt  | ttncaaaaaa | tgcgarrggk  | 240  |
| gggyctccwr  | rnaytyyaaw  | awgramsgk   | tawytmcwa   | ktgrggggwn | ttwtatcawt  | 300  |
| aaaggnssgg  | ggktytawkw  | tttawraarr  | ggragcttta  | graawawaaw | arwcmgtkgk  | 360  |
| ktttaaraga  | rattkwwaar  | rraactggrw  | traaktwww   | rwrttatwat | anaaatrkkw  | 420  |
| aakggwwrta  | tagagggaaa  | aaaattttaa  | ggataaatga  | argaaaccca | tcwccattta  | 480  |
| ttttccaaga  | sgaccaaaga  | aatgatagaa  | gttggttaaat | ttatgggtgc | gtaaaaagaa  | 540  |
| attttcccaa  | awttttaawt  | yccttggtt   | aaaggattaa  | acmcttgrrt | ggaagcaatt  | 600  |
| atatggtaaa  | gaacmtccag  | ctcgtattag  | tttgccawgc  | tatccttttg | ccaaagagcg  | 660  |
| gttattgggt  | ggatactgat  | aagtttagtcg | acggtagtta  | tytcaaccct | agrcagaggg  | 720  |
| gaatwaatac  | agatagtgat  | aagtttgatg  | aaaagcttta  | tgaatccttg | ttggacaatc  | 780  |
| ttttttccaa  | aactatgacm  | cctgatgaag  | ctattaagtt  | aatggaagag | gaggtatcat  | 840  |
| gaaaaaatta  | attaaattga  | tttatgaaaa  | agtttttgaa  | aataaactat | caaaatcaga  | 900  |
| agccttgctg  | ttgatttagtg | gattgaaggc  | gagcaatact  | actatccttc | atcccccttat | 960  |
| acatgaaaac  | acgtcaagtt  | tttttgaaaa  | aaaattcagt  | tcaacttttt | ctggtagaga  | 1020 |
| atttttcttt  | cggatagatg  | ctaaccttaa  | aaaagtgta   | ttatctcctg | taacatacct  | 1080 |
| tgaaatgggt  | tatgctgcag  | caacaaaggc  | aatggctggg  | gagaaatttt | cagcgcaatn  | 1140 |
| ttaaaaaaat  | tgagtggcaa  | tatccagcta  | ttgttcatga  | agagtcgata | acagttcata  | 1200 |
| ttcgtttttt  | taaagatcca  | aatacctggg  | tggtatacaag | tgaggagaaa | tttttatgct  | 1260 |
| atcaaattta  | cacaatttca  | aataatcaag  | aaacanangc  | gatattgttc | acaaccgggg  | 1320 |
| tgtaatagat  | tatgatcata  | aaaatagtga  | attaagtcca  | cttgatattt | tttcactaca  | 1380 |
| aaagcatatc  | agtgaatatt  | ttctagaccc  | taaagaggat  | agtgattttt | ttgaaaagag  | 1440 |
| cgataaaagt  | aatgagccct  | attatcagag  | tattgaattg  | ttacatatta | attttcagaa  | 1500 |
| agaagcgctt  | ataaaattat  | cgtttgatca  | cgatcagga   | tacatataac | catcaagagt  | 1560 |
| cattgggtttt | acatccagat  | atactggagt  | tggttttaca  | atcctgtagc | ttcttatgcc  | 1620 |
| ttgatatggc  | agatactgga  | atctgagttt  | ttcggggggag | ttgcagccca | gtgagtggta  | 1680 |
| gatgctttta  | tcaaatncat  | gtctcggtcg  | gtccagggac  | ctcaaatggg | gggktttggg  | 1740 |
| ttaccggctt  | aacarsyttc  | catggaaggg  | tagggnttaw  | atagscran  | tattttggccy | 1800 |
| tkggtgrtg   | aatrawrgtw  | atkcskggg   | wccwgstamw  | wagggttggg | ttytcaaaac  | 1860 |
| cawawraamm  | skgtttyttg  | rrkwttttt   | tssmmmmg    | scnaaatng  | aacccccnn   | 1920 |
| ngngtaaaanc | cccngaaat   | tnntntttt   | tttttncccc  | gnnccccaan | cnnagaaang  | 1980 |
| aacctttncg  | nggttttggg  | caattaaatt  | taattagggc  | aaacccccn  | ttaatnggaa  | 2040 |
| ggggggncca  | nttggnggtt  | ttttttngga  | aaaaggaagg  | gnaaattggg | gnnaaaaagg  | 2100 |
| ccccccaaa   | nttnggtttt  | aaaaagggga  | aaaaaaaatn  | aaccgtttta | aaaaattnnc  | 2160 |
| ccccaaant   |             |             |             |            |             | 2169 |

<210> 37  
 <211> 8380  
 <212> DNA  
 <213> Endobugula sertula

<220>  
 <221> misc\_feature  
 <222> (1)...(8380)  
 <223> N refers to any nucleotide.

<400> 37

|            |             |             |             |            |             |      |
|------------|-------------|-------------|-------------|------------|-------------|------|
| gcaccgttg  | aacgttatgg  | catcgattca  | ttgattgtga  | ttcaggtgaa | tcaggcggtg  | 60   |
| gcggtatatt | ttgatgcgt   | gcctaaaaca  | ctgttatattg | aatatcaaac | gatagacgcg  | 120  |
| gtcgtggctt | acttggttga  | gcagcaccgc  | caggcatgta  | gggtgtggac | ggggttaacg  | 180  |
| gcaacgggtc | aagctcaaag  | agagggtgtc  | atctcctcta  | cctcatcagc | gggtgttgaa  | 240  |
| cctgtgacac | cgagacagaa  | agagggtcat  | cctatacaga  | aagacatcaa | gtgccgagaa  | 300  |
| cacccagtga | cagacgagcc  | tatagccatt  | attgggtctga | gtggacatta | tccgcaagcg  | 360  |
| aatagtttgg | atgctgtattg | ggaaaacttg  | aaggcaggaa  | aagattgtat | tcgtgaaatt  | 420  |
| cccgatgacc | gttggtcgct  | agacggtttt  | ttccatgaag  | atggtgaaga | agcgattgcg  | 480  |
| caagggaaaa | gttacagtaa  | atggggcggt  | tttttagagg  | gatttgctga | ttttgacctt  | 540  |
| ctctttttta | acctatcgcc  | gcgagagggtg | atgacgatcg  | atccacagga | gcgtttgttt  | 600  |
| ttacagagtg | cgtgggaagc  | tgtggaggat  | gccggttatc  | gcgtgctcag | cttgcttcgc  | 660  |
| agtttaacaa | gcgtgtgggt  | gtatttgctg  | gtattacca   | gacgggtttt | gatttttatg  | 720  |
| gaatacaatc | ggatcsagct  | sbtynycgc   | wnatacttc   | ctnttackcc | aggtttaaaa  | 780  |
| rgccwmgwtc | agctntkttt  | tsgggttttt  | taabthhgcg  | gkggggtktt | ttkvsccvwa  | 840  |
| tnagcancsg | dgggtttttk  | mattttttta  | wtggraanac  | nncaatcggt | atcaacntct  | 900  |
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| aggagtatat | tccagaagtc  | agtcagacac  | gacaatcaga  | ggtcaggaat | aaaccagctc  | 1860 |
| acccggtggc | cattctgcta  | tctgcgcata  | cttccgctca  | gttactgaag | atggccgagg  | 1920 |
| cacttttact | atttattcgt  | accatagtga  | ataatatgga  | ctcatcctat | tcggcagggg  | 1980 |
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| gggtgtgcta | tgggaattgca | acgattgcag  | cggtggagcg  | aggggctcaa | gtattagccg  | 2820 |

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| attgaacgaa  | gagtggattt  | tacaggtaac  | tatgagtatg  | gggaacctgc  | taatagtmw   | 6300 |

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| mcmsanngmr  | acgtacaagm  | rtgwcaccmg | krkgcytrya | snmattmgct  | atcamrcnca  | 8340 |
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<210> 38

<211> 1812

<212> PRT

<213> Endobugula sertula

<220>

<221> PEPTIDE

<222> (1)...(1810)

<223> Corresponds to open reading frame in SEQ ID NO:29.

<400> 38

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Val | Val | Val | Glu | Phe | Phe | Val | Ser | Tyr | Arg | Asp | Ile | Leu | Lys |
| 1   |     |     |     | 5   |     |     |     | 10  |     |     |     |     | 15  |     |
| Ala | Leu | Gln | Asp | Glu | Lys | Ile | Ser | Phe | Glu | Glu | Ala | Lys | Tyr | Lys |
|     |     |     |     | 20  |     |     |     | 25  |     |     |     |     | 30  |     |
| Ile | Lys | Arg | Lys | Asp | Lys | Lys | Ser | Lys | Gln | Arg | Leu | Asn | His | Asp |
|     |     |     |     | 35  |     |     |     | 40  |     |     |     |     | 45  |     |
| Glu | Leu | Asn | Arg | Ser | Met | Asn | Ile | Thr | Pro | Lys | Ile | Val | Asn | Asn |
|     |     |     |     | 50  |     |     |     | 55  |     |     |     |     | 60  |     |
| Gly | Leu | Val | Leu | Leu | Gly | Gly | His | Leu | Phe | Glu | Glu | Leu | Arg | Leu |
| 65  |     |     |     |     |     |     |     | 70  |     |     |     |     |     | 80  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Glu | Trp | Lys | Ala | Ala | Asn | Pro | Asn | Pro | Asn | Glu | Val | Ser | Ile | Gln | Val | 85  | 90  | 95  |
| Lys | Ala | Ser | Ala | Ile | Ser | Phe | Thr | Asp | Thr | Leu | Cys | Val | Gln | Gly | Leu | 100 | 105 | 110 |
| Tyr | Pro | Ser | His | Tyr | Pro | Phe | Val | Pro | Gly | Phe | Glu | Val | Ser | Gly | Val | 115 | 120 | 125 |
| Ile | Arg | Gln | Val | Gly | Glu | His | Ile | Thr | Asp | Leu | His | Val | Gly | Asp | Glu | 130 | 135 | 140 |
| Val | Ile | Ala | Phe | Thr | Gly | Ser | Ser | Met | Gly | Gly | His | Ala | Ala | Tyr | Val | 145 | 150 | 155 |
| Thr | Val | Pro | Gln | Asp | Tyr | Val | Val | Arg | Lys | Pro | Lys | Asp | Leu | Ser | Phe | 165 | 170 | 175 |
| Glu | Asp | Ala | Cys | Ser | Phe | Pro | Leu | Ala | Phe | Ala | Thr | Val | Tyr | His | Ser | 180 | 185 | 190 |
| Phe | Ala | Arg | Gly | Lys | Leu | Ser | His | Asn | Asp | His | Ile | Leu | Ile | Gln | Thr | 195 | 200 | 205 |
| Ala | Thr | Gly | Gly | Cys | Gly | Leu | Met | Ala | Leu | Gln | Leu | Ala | Arg | Leu | Lys | 210 | 215 | 220 |
| Gln | Cys | Val | Cys | Tyr | Gly | Thr | Ser | Ser | Arg | Glu | Asp | Lys | Leu | Ala | Leu | 225 | 230 | 235 |
| Leu | Lys | Gln | Trp | Ala | Leu | Pro | Tyr | Val | Phe | Asn | Tyr | Lys | Thr | Cys | Asn | 245 | 250 | 255 |
| Ile | Asp | Glu | Glu | Ile | Gln | Arg | Val | Ser | Gly | His | Arg | Gly | Val | Asp | Val | 260 | 265 | 270 |
| Val | Leu | Asn | Met | Leu | Pro | Gly | Glu | His | Ile | Gln | Gln | Gly | Leu | Asn | Ser | 275 | 280 | 285 |
| Leu | Ala | Lys | Gly | Gly | Arg | Tyr | Leu | Glu | Leu | Ser | Met | His | Gly | Leu | Leu | 290 | 295 | 300 |
| Thr | Asn | Glu | Pro | Val | Ser | Leu | Ser | Ser | Leu | Arg | Phe | Asn | Gln | Ser | Val | 305 | 310 | 315 |
| Gln | Thr | Ile | Asn | Leu | Leu | Gly | Leu | Leu | Asn | Lys | Gly | Asp | Asp | Gly | Phe | 325 | 330 | 335 |
| Ile | Gly | Ser | Val | Leu | Ala | Gln | Met | Val | Ser | Trp | Ile | Glu | Ser | Gly | Asp | 340 | 345 | 350 |
| Leu | Val | Ser | Thr | Val | Ser | Arg | Ile | Tyr | Pro | Leu | Asp | Gln | Ile | Gly | Glu | 355 | 360 | 365 |
| Ala | Leu | Arg | Tyr | Val | Ser | Glu | Gly | Glu | His | Ile | Gly | Lys | Val | Val | Val | 370 | 375 | 380 |
| Ser | His | Thr | Ala | Thr | Glu | Pro | Met | Asp | Cys | Arg | Gln | Arg | Cys | Ile | Asp | 385 | 390 | 395 |
| Asn | Val | Leu | Lys | Gln | Gly | Gln | Met | Ala | Ala | Leu | Thr | Ala | Thr | Gly | Gly | 405 | 410 | 415 |
| Lys | Ser | Arg | Val | Trp | Gly | Gly | Thr | Gly | Val | Asn | Asp | Lys | Pro | Ser | Pro | 420 | 425 | 430 |
| Ala | Val | Gly | Ile | Glu | Glu | Arg | Leu | Leu | Glu | Gly | Ile | Ala | Val | Ile | Gly | 435 | 440 | 445 |
| Leu | Ser | Gly | Gln | Tyr | Pro | Lys | Ser | Lys | Thr | Leu | Glu | Gln | Phe | Trp | Gln | 450 | 455 | 460 |
| Thr | Leu | Ala | Asp | Gly | Val | Asp | Cys | Ile | Ser | Glu | Ile | Pro | Ala | Asp | Arg | 465 | 470 | 475 |
| Trp | Ser | Leu | Glu | Glu | Tyr | Tyr | Ser | Pro | Ile | Pro | Glu | Gly | Gly | Lys | Thr | 485 | 490 | 495 |
| Tyr | Cys | Lys | Trp | Met | Gly | Val | Leu | Glu | Asp | Met | Asp | Cys | Phe | Asp | Pro | 500 | 505 | 510 |
| Leu | Phe | Phe | Ala | Ile | Ser | Pro | Arg | Glu | Ala | Glu | Val | Met | Asp | Pro | Gln | 515 | 520 | 525 |
| Gln | Arg | Leu | Phe | Leu | Glu | Asn | Ala | Trp | Ser | Cys | Ile | Glu | Asp | Ala | Gly | 530 | 535 | 540 |

|     |     |     |     |     |     |     |      |     |     |     |     |     |      |     |     |
|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|------|-----|-----|
| Ile | Asn | Pro | Lys | Met | Leu | Ser | Arg  | Ser | Arg | Cys | Gly | Val | Phe  | Val | Gly |
| 545 |     |     |     |     | 550 |     |      |     |     | 555 |     |     |      |     | 560 |
| Cys | Gly | Ala | Asn | Asp | Tyr | Ser | Ala  | Leu | Met | Asn | Ser | Ser | His  | Ser | Thr |
|     |     |     |     | 565 |     |     |      |     | 570 |     |     |     |      | 575 |     |
| Ser | Leu | Glu | Leu | Met | Lys | Glu | Leu  | Gly | Asn | Asn | Ser | Ser | Ile  | Leu | Ser |
|     |     |     | 580 |     |     |     |      | 585 |     |     |     |     | 590  |     |     |
| Ala | Arg | Ile | Ser | Tyr | Phe | Leu | Asn  | Leu | Lys | Gly | Pro | Cys | Leu  | Ala | Ile |
|     | 595 |     |     |     |     |     | 600  |     |     |     |     | 605 |      |     |     |
| Asp | Thr | Ala | Cys | Ser | Ser | Ser | Leu  | Val | Ala | Ile | Ala | Glu | Ser  | Cys | Asn |
|     | 610 |     |     |     |     |     | 615  |     |     |     |     | 620 |      |     |     |
| Ser | Leu | Val | Leu | Gly | Thr | Ser | Asp  | Leu | Ala | Leu | Ala | Gly | Gly  | Val | Leu |
| 625 |     |     |     |     | 630 |     |      |     |     | 635 |     |     |      |     | 640 |
| Leu | Met | Pro | Gly | Pro | Ser | Leu | His  | Ile | Gly | Leu | Ser | His | Gly  | Glu | Met |
|     |     |     |     | 645 |     |     |      |     | 650 |     |     |     |      | 655 |     |
| Leu | Ser | Val | Asp | Gly | Arg | Cys | Phe  | Thr | Phe | Asp | Gln | Arg | Ala  | Asn | Gly |
|     |     |     | 660 |     |     |     |      | 665 |     |     |     |     |      | 670 |     |
| Phe | Val | Pro | Gly | Glu | Gly | Val | Gly  | Val | Val | Leu | Leu | Lys | Arg  | Met | Ser |
|     | 675 |     |     |     |     |     | 680  |     |     |     |     |     | 685  |     |     |
| Asp | Ala | Val | Arg | Asp | Gly | Asp | Pro  | Ile | Arg | Ala | Val | Ile | Arg  | Gly | Trp |
|     | 690 |     |     |     |     |     | 695  |     |     |     |     | 700 |      |     |     |
| Gly | Val | Asn | Gln | Asp | Gly | Arg | Ser  | Asn | Gly | Ile | Thr | Ala | Pro  | Ser | Ser |
| 705 |     |     |     |     | 710 |     |      |     |     | 715 |     |     |      |     | 720 |
| Lys | Ala | Gln | Ser | Ala | Leu | Glu | Gln  | Glu | Val | Tyr | Gln | Arg | Phe  | Asn | Ile |
|     |     |     |     | 725 |     |     |      |     | 730 |     |     |     |      | 735 |     |
| Asp | Pro | Ser | Ser | Ile | Thr | Leu | Val  | Glu | Ala | His | Gly | Thr | Gly  | Thr | Lys |
|     |     |     | 740 |     |     |     |      | 745 |     |     |     |     | 750  |     |     |
| Leu | Gly | Asp | Pro | Ile | Glu | Val | Glu  | Ala | Leu | Ala | Glu | Ser | Phe  | Arg | Val |
|     | 755 |     |     |     |     |     | 760  |     |     |     |     | 765 |      |     |     |
| Tyr | Thr | Asp | Lys | Arg | His | Tyr | Cys  | Ala | Leu | Gly | Ser | Val | Lys  | Ser | Asn |
|     | 770 |     |     |     |     | 775 |      |     |     |     | 780 |     |      |     |     |
| Ile | Gly | His | Leu | Gly | Val | Gly | Ala  | Gly | Ile | Ala | Gly | Val | Thr  | Lys | Val |
| 785 |     |     |     |     | 790 |     |      |     |     | 795 |     |     |      |     | 800 |
| Leu | Leu | Ser | Leu | Gln | His | Arg | Met  | Leu | Pro | Pro | Thr | Ile | His  | Cys | Glu |
|     |     |     |     | 805 |     |     |      |     | 810 |     |     |     |      | 815 |     |
| Asp | Val | Asn | Pro | Gln | Ile | Ala | Leu  | Glu | Gly | Ser | Pro | Phe | Tyr  | Ile | Asn |
|     |     |     | 820 |     |     |     |      | 825 |     |     |     |     | 830  |     |     |
| Thr | Glu | Leu | Lys | Pro | Trp | Gln | Ser  | Gly | Asp | Ser | Ile | Pro | Arg  | Arg | Ala |
|     | 835 |     |     |     |     |     | 840  |     |     |     |     |     | 845  |     |     |
| Gly | Val | Ser | Ser | Phe | Gly | Phe | Ser  | Gly | Thr | Asn | Ala | His | Leu  | Val | Leu |
|     | 850 |     |     |     |     | 855 |      |     |     |     | 860 |     |      |     |     |
| Glu | Glu | Tyr | Leu | Pro | His | Ser | Thr  | Gly | Thr | Ile | Glu | Ser | Phe  | Ala | Ala |
| 865 |     |     |     |     | 870 |     |      |     |     | 875 |     |     |      |     | 880 |
| Asn | His | Ala | Ser | Thr | Val | Ile | Ile  | Pro | Leu | Ser | Ala | Lys | Ser  | His | Asn |
|     |     |     |     | 885 |     |     |      |     | 890 |     |     |     |      | 895 |     |
| Ser | Leu | Tyr | Thr | Tyr | Ala | Gln | Thr  | Leu | Leu | Ile | Phe | Leu | Lys  | Arg | Ser |
|     |     |     | 900 |     |     |     |      | 905 |     |     |     |     | 910  |     |     |
| Gln | Val | Thr | Asp | Ala | Lys | Lys | Ile  | Thr | Ile | Asp | His | Met | Glu  | Cys | Arg |
|     | 915 |     |     |     |     |     | 920  |     |     |     |     | 925 |      |     |     |
| Leu | Leu | Asp | Leu | Ala | Tyr | Thr | Leu  | Gln | Val | Gly | Arg | Glu | Ala  | Met | Asp |
|     | 930 |     |     |     |     | 935 |      |     |     |     | 940 |     |      |     |     |
| Lys | Arg | Ile | Ser | Phe | Ile | Val | Asn  | Thr | Lys | Gln | Ala | Leu | Val  | Glu | Lys |
| 945 |     |     |     |     | 950 |     |      |     |     | 955 |     |     |      |     | 960 |
| Leu | Asn | Ala | Phe | Leu | Glu | Lys | Glu  | Lys | Thr | Ile | Thr | Asp | Cys  | Tyr | His |
|     |     |     |     | 965 |     |     |      |     | 970 |     |     |     |      | 975 |     |
| Tyr | Leu | Phe | Asp | Ser | Asp | Lys | Pro  | Ser | Thr | Glu | Ile | Phe | Arg  | Leu | Asp |
|     |     |     | 980 |     |     |     |      | 985 |     |     |     |     | 990  |     |     |
| Glu | Asp | Asp | Lys | Val | Leu | Ile | Asn  | Ser | Trp | Ile | Ser | Gln | Ser  | Gln | Tyr |
|     |     |     | 995 |     |     |     | 1000 |     |     |     |     |     | 1005 |     |     |



His Lys Leu Ala Glu Ala Trp Ser Gln Gly Leu Asp Ile Asp Trp Thr  
 1010 1015 1020  
 Leu Leu Tyr Thr His Ser Ser Thr Pro Arg Arg Ile Ser Leu Pro Thr  
 1025 1030 1035 1040  
 Tyr Pro Phe Ala Arg Asp Arg Tyr Trp Leu Pro Glu Lys Pro Arg Tyr  
 1045 1050 1055  
 Asn Ala Ala Asn His Pro Val Ser Asn His Gln Thr Thr Thr Gln Asn  
 1060 1065 1070  
 His Ser Arg Phe Ala Ile Asp Thr Asp His Asp Val Val Ala Glu Ile  
 1075 1080 1085  
 Met Gln Lys Thr His Gln Gln Glu Leu Glu Gln Trp Leu Leu Lys Leu  
 1090 1095 1100  
 Leu Phe Val Gln Leu Gln His Met Gly Leu Phe Gln His Arg Val Phe  
 1105 1110 1115 1120  
 Glu Thr Ala Thr Ala Leu Arg Gln Ser Ala Gly Ile Val Asp Lys Tyr  
 1125 1130 1135  
 Asp Arg Trp Trp His Glu Cys Leu Ser Val Leu Gln Asp Ala Gly Tyr  
 1140 1145 1150  
 Leu Glu Trp Lys Asp Asp Ser Val Ala Ala Ala Gln Ala Leu Glu Ser  
 1155 1160 1165  
 Glu Ser Gln Glu Ala Trp Trp Ser Arg Trp Asn Thr Glu Tyr Lys His  
 1170 1175 1180  
 Tyr Gln Asn Asp Pro Glu Lys Lys Thr Leu Ala Ile Leu Ile Asn Asp  
 1185 1190 1195 1200  
 Cys Leu Gln Ala Leu Pro Gly Val Leu Ser Gly Glu Gln Leu Ile Thr  
 1205 1210 1215  
 Asp Ile Ile Phe Pro Asn Gly Ser Met Glu Lys Met Glu Gly Leu Tyr  
 1220 1225 1230  
 Lys Asn Asn Arg Ile Ala Asp Tyr Cys Asn Gln Cys Val Gly Asp Leu  
 1235 1240 1245  
 Leu Val Gln Phe Ile Glu Ala Arg Leu Ser Arg Asp Ala Asn Ala Arg  
 1250 1255 1260  
 Ile Arg Ile Ile Glu Ile Gly Ala Gly Thr Gly Gly Thr Thr Ala Ile  
 1265 1270 1275 1280  
 Val Leu Pro Met Leu Gln Ala Tyr Gln Asp His Ile Asp Thr Tyr Cys  
 1285 1290 1295  
 Tyr Thr Asp Val Ser Lys Ala Phe Leu Met His Gly Gln Glu His Tyr  
 1300 1305 1310  
 Gly Glu Gln Tyr Pro Tyr Leu Ser Tyr Cys Leu Cys Asn Ile Glu Gln  
 1315 1320 1325  
 Asp Leu Val Ala Gln Gly Ile Ser Val Gly Asp Tyr Asp Ile Ala Ile  
 1330 1335 1340  
 Ala Ala Asn Val Leu His Ala Thr Arg Asn Ile His Glu Thr Val Ser  
 1345 1350 1355 1360  
 His Val Arg Gln Ala Leu Ala Ala Asn Gly Leu Leu Ile Leu Asn Glu  
 1365 1370 1375  
 Phe Ser Gln Lys Ser Val Phe Ser Ser Val Ile Phe Gly Leu Ile Asp  
 1380 1385 1390  
 Gly Trp Ala Leu Ser Glu Asp Thr Gly Leu Arg Ile Pro Gly Ser Pro  
 1395 1400 1405  
 Gly Leu Tyr Pro Lys Gln Trp Gln Ala Val Leu Glu Ala Ser Gly Phe  
 1410 1415 1420  
 Gly Asp Val Glu Phe Pro Leu His Asp Ala Arg Glu Leu Gly Gln Gln  
 1425 1430 1435 1440  
 Ile Ile Leu Ala Thr Asn Ala His Ala Asn Val Ala Ser Asp Leu Ala  
 1445 1450 1455  
 Thr Ser Val Ile Asp His Ala Pro Lys Arg Leu Pro Ser Ala Glu Val  
 1460 1465 1470

|                         |   |
|-------------------------|---|
| Ser Met Asp Glu Arg Val | Ser His Asp Ala Met Met Lys Ala Ser Val |
| 1475                    | 1480 1485                               |
| Lys Gln Leu Leu Val Glu | Gln Leu Ser Gln Ser Leu Lys Leu Asp Met |
| 1490                    | 1495 1500                               |
| Asn Glu Ile His Pro Asp | Glu Ser Phe Ala Asp Tyr Gly Val Asp Ser |
| 1505                    | 1510 1515 1520                          |
| Ile Thr Gly Ala Ser Phe | Ile Gln Gln Leu Asn Asp Thr Leu Thr Leu |
| 1525                    | 1530 1535                               |
| Thr Leu Lys Thr Val Cys | Leu Phe Asp His Ser Ser Val Asn Arg Leu |
| 1540                    | 1545 1550                               |
| Thr Ala Tyr Leu Leu Ser | Asp Tyr Gly Asp Asp Ile Ala Gln Trp Leu |
| 1555                    | 1560 1565                               |
| Ala Thr Ala Pro Ala Leu | Val Asp His Pro Gln Ser Val Val Ser Gln |
| 1570                    | 1575 1580                               |
| Val Leu Pro Glu Arg Ser | Pro Ala Ser Thr Gln Ala Lys Pro Leu Pro |
| 1585                    | 1590 1595 1600                          |
| Ser Val Pro Pro Ser Leu | Ser Met Glu Ser Pro Val Gln Gln Glu Ser |
| 1605                    | 1610 1615                               |
| Ile Ala Ile Ile Gly Met | Ser Gly Arg Phe Ala Ala Ser Glu Asn Leu |
| 1620                    | 1625 1630                               |
| Glu Ala Phe Trp Gln Gln | Leu Ala Gln Gly Val Asp Leu Val Glu Pro |
| 1635                    | 1640 1645                               |
| Ala Ser Arg Trp Gly Pro | Gln Ala Glu Thr Tyr Tyr Gly Ser Phe Leu |
| 1650                    | 1655 1660                               |
| Lys Asp Met Asp Gln Phe | Asp Pro Leu Phe Phe Asn Leu Ser Gly Val |
| 1665                    | 1670 1675 1680                          |
| Glu Ala Ser Tyr Met Asp | Pro Gln Gln Arg Cys Phe Leu Glu Glu Ser |
| 1685                    | 1690 1695                               |
| Trp Asn Ala Leu Glu Asn | Ala Gly Tyr Val Gly Asp Gly Ile Glu Gly |
| 1700                    | 1705 1710                               |
| Lys Arg Cys Gly Ile Tyr | Ala Gly Cys Val Ser Gly Asp Tyr Ala Gln |
| 1715                    | 1720 1725                               |
| Leu Leu Gly Asp Gln Pro | Pro Pro Gln Ala Phe Trp Gly Asn Ala Ser |
| 1730                    | 1735 1740                               |
| Ser Ile Ile Pro Ala Arg | Ile Ala Tyr Tyr Leu Asn Leu Gln Gly Pro |
| 1745                    | 1750 1755 1760                          |
| Ala Thr Ala Val Asp Thr | Ala Cys Ser Ser Ser Leu Val Ala Val His |
| 1765                    | 1770 1775                               |
| Leu Ala Cys Gln Ala Leu | His Leu Asp Glu Met Glu Met Ala Leu Ala |
| 1780                    | 1785 1790                               |
| Gly Gly Val Ser Leu Tyr | Pro Thr Pro Ile Ile Val Glx Val Phe Ala |
| 1795                    | 1800 1805                               |
| Trp Cys Arg Tyr         |   |
| 1810                    |   |

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